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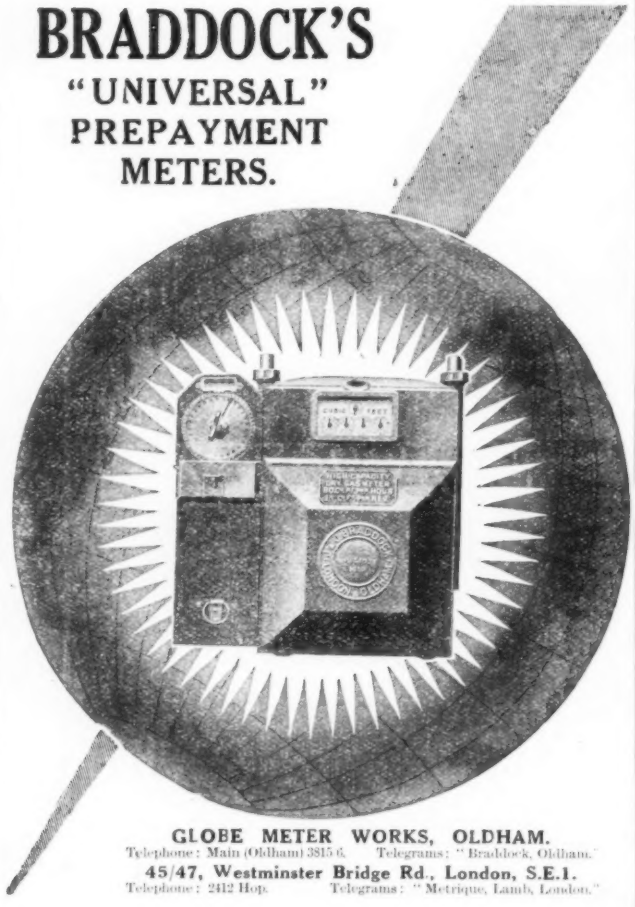

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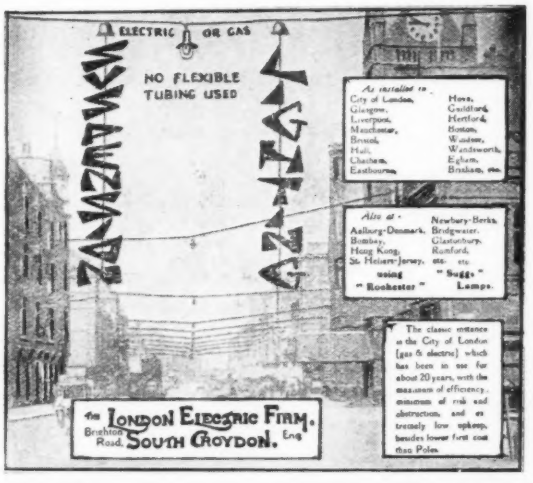
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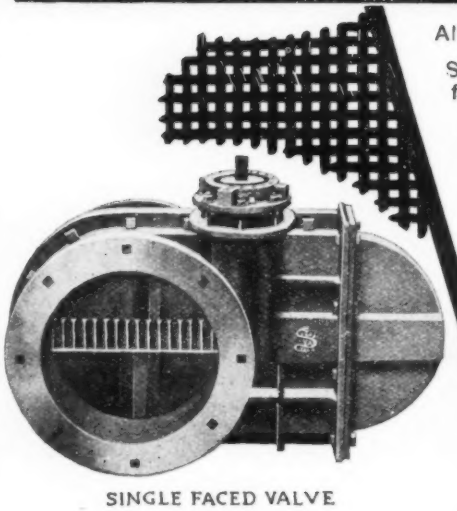

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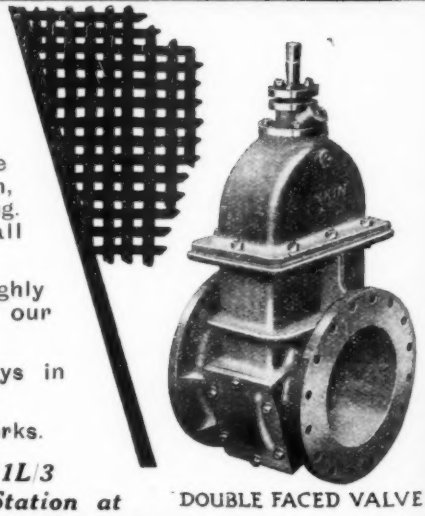

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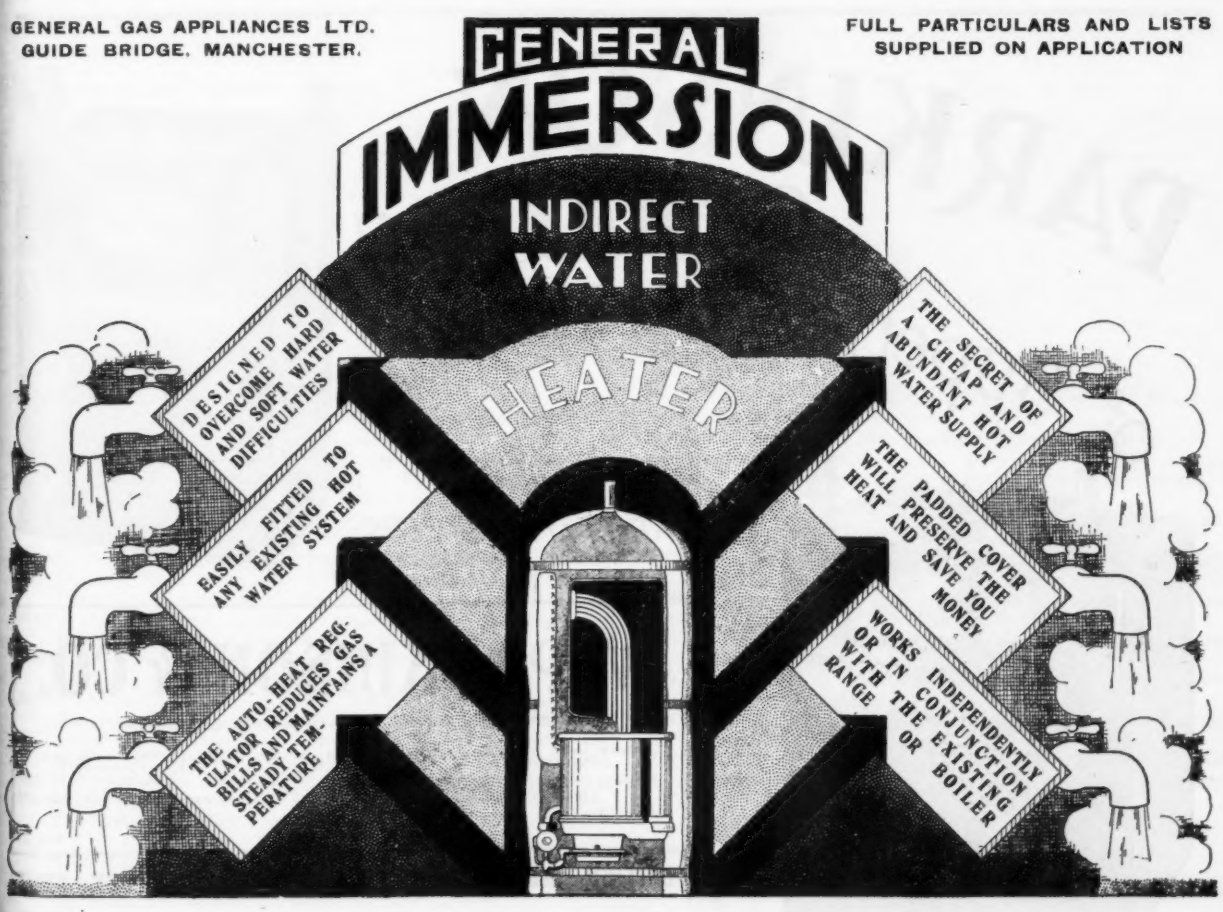
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THE GAS JOURNAL

MARCH 1, 1933

Vol. 201. 85th Year No. 3641

A Glance at the Contents—

The Neunkirchen Explosion.

Several letters on the Neunkirchen Explosion, including one from Dr. Charles Carpenter, are published to-day. [p. 536.]

Heat Insulation.

This subject was dealt with by Mr. A. Lindsay Foster, M.I.Mech.E., in a paper which he read on Feb. 8 before the Institute of Fuel. [p. 566.]

Distribution Practice at Croydon.

We publish to-day a report of the discussion on Mr. P. Richbell's paper, read before the London and Southern District Junior Gas Association on Feb. 17, an extract of which appeared in last week's issue. [p. 562.]

Bristol's Showrooms.

The Directors of the Bristol Gas Company have decided to reconstruct their showrooms in Colston Street and to provide "one of the most modern showrooms in the country." In the meantime, excellent temporary accommodation has been provided, as will be seen from our photographs on p. 561.

Commercial and Industrial Business.

At a joint conference of the National Gas Council, the Institution of Gas Engineers, and the B.C.G.A., held at the Hotel Metropole, London, on Feb. 7, a resolution was passed approving the setting up of gas development centres in selected places and the appointment of a liaison committee to co-ordinate their work. [p. 545.]

Accountant Required.

A qualified accountant is required by a Gas Company in the London District, the commencing salary being £450 per annum. [p. 575.]

Water Gas Manufacture.

Dr. F. J. Dent dealt with some aspects of water gas manufacture in a paper which he read on Feb. 18 before the Yorkshire Junior Gas Association. [p. 565.]

Re-Verification of Gas Meters.

This subject was discussed at a meeting of representatives of authorities of Great Britain administering the Sales of Gas Acts, and a resolution was carried that meters should be re-verified every ten years. This proposal is to be submitted to the Board of Trade. [p. 561.]

Public Lighting at Tottenham.

That the Tottenham and District Gas Company were fortunate in having over 90% of the public lighting over their area of more than 100 sq. miles was mentioned by Mr. Henry Woodall, presiding over the Company's Annual General Meeting on Feb. 21. [p. 569.]

The Junior Associations at the Fair.

Members of the Junior Gas Associations from all quarters of the country converged upon Castle Bromwich on Thursday of last week, when they were entertained at luncheon at the kind invitation of the Birmingham Chamber of Commerce, and spent a most interesting day inspecting the exhibits at the British Industries Fair. [p. 558.]

Forthcoming Engagements

March 4.—SCOTTISH JUNIOR GAS ASSOCIATION.—Meeting in Glasgow. Address by Major Geoffrey Kitson, Immediate Past President of the B.C.G.A.

March 9.—MIDLAND ASSOCIATION OF GAS ENGINEERS.—Annual Meeting in Birmingham. Presidential Address by Mr. T. H. Poulson. At 2.30.

March 9.—MIDLAND JUNIOR ASSOCIATION.—Meeting. Paper by Mr. A. W. Attwood.

March 10.—MANCHESTER DISTRICT ASSOCIATION. — Annual General Meeting, Midland Hotel, Manchester, 2.30 p.m. Presidential Address by Mr. G. Dixon.

March 11.—WESTERN JUNIOR ASSOCIATION.—Meeting at Bath. Four short papers.

March 13.—INSTITUTION OF GAS ENGINEERS.—Meeting of Meters Committee, 2.30 p.m.

March 14.—INSTITUTION OF GAS ENGINEERS.—Meetings of Finance Sub-Committee, 10 a.m.; Finance Committee, 10.30 a.m.; Executive Committee of the Council, 11 a.m.; Gas Education Executive Committee, 4 p.m.

March 14.—N.G.C.—Meeting of Central Executive Board.

March 14.—FEDERATION OF GAS EMPLOYERS.—Meeting of Central Committee.

March 15.—INSTITUTION OF GAS ENGINEERS.—Meeting of Board of Examiners, 10.30 a.m.

March 15.—B.C.G.A.—Meeting of Executive Committee, 12 noon, 28, Grosvenor Gardens, S.W. 1.

March 16.—INSTITUTION OF GAS ENGINEERS.—Meeting of Refractory Materials Joint Sub-Committee, 2.30 p.m.

March 16.—SOCIETY OF BRITISH GAS INDUSTRIES.—Meeting, 12 noon, 56, Victoria Street, S.W. 1.

March 16.—SOUTHERN ASSOCIATION (WESTERN DISTRICT).—Meeting at Exeter.

March 17.—LONDON AND SOUTHERN JUNIOR ASSOCIATION.—Meeting. Paper by Mr. C. M. Wearing.

April 6.—MIDLAND JUNIOR ASSOCIATION.—Meeting. Paper by Mr. W. T. Hobson.

April 7.—NORTH BRITISH ASSOCIATION OF GAS MANAGERS.—Spring Meeting in Glasgow.

April 12.—INSTITUTE OF FUEL.—Visit to Beckton Coke Ovens and Greenwich "Metro-Coalite" plants.

April 19.—B.C.G.A.—Meeting of Executive Committee, 12 noon, 28, Grosvenor Gardens, S.W. 1.

May 5.—NORTH OF ENGLAND ASSOCIATION.—Annual Meeting, County Hotel, Newcastle, at 2 o'clock.

May 11-12.—EASTERN COUNTIES ASSOCIATION.—Spring General Meeting at Croydon.

May 11.—SOCIETY OF BRITISH GAS INDUSTRIES.—Annual General Meeting and Dinner, Hotel Metropole, London.

1933 "JOURNAL" Directory.

Page 32. HAYFIELD. F. Platt appointed Engineer and Manager.

EDITORIAL NOTES

A Constructive Move

AN important conference of the Gas Industry was held in London last month. The three National Bodies—the National Gas Council, the Institution of Gas Engineers, the British Commercial Gas Association—combined in an invitation to their members, and the response to this invitation to attend the meeting is one of the most heartening signs of the "awareness" of our Industry to the need for greater individual and greater collective effort to advance the sales of gas in face of competition which is well organized and certainly grows keener every day. We simply must unite as an Industry, sinking petty jealousies, abandoning the parochial outlook, if we are to succeed as we can succeed through co-operative working. The opportunity for a vast expansion in business lies at our door; unless there is unity in the Gas Industry, this opportunity cannot be seized.

This fact—it is a policy which we have steadfastly put forward in the "JOURNAL" for years—is, we think, at long last being appreciated. At any rate the meeting in question was attended by over four hundred members of the three National Bodies and was marked by a keenness and a sense of common purpose which we have never known equalled at any Gas Industry conference. Sir David Milne-Watson, who took the chair, conducted the meeting as only a real leader, an enthusiast, a man of vision, could have done; and he was ably supported by the Presidents of the Institution and of the B.C.G.A. He must have felt more than gratified by the obvious appreciation of his audience and by the result of the meeting—unanimity of agreement with the resolution which he moved.

This resolution is a fine constructive effort, and the policy outlined must be supported by every gas undertaking, irrespective of size, irrespective of private or municipal control. The aim is quite simple—the setting-up of Gas Development Centres in selected areas in Great Britain and co-ordination of the work of all the Centres by a properly staffed Liaison Committee. This needs work and money; but we have not the slightest doubt that whatever work and whatever money are expended on the scheme will bring great reward in better and bigger gas business. Our belief is based on facts.

The Development Centres will concentrate primarily on the industrial and commercial fields, the potentialities of which are enormous. Organized service and research on the lines laid down in the resolution at the meeting will transform these potentialities into live and lasting business. There is immediate need for the setting-up of these Centres. Certain large undertakings—we mention Birmingham, the Gas Light and Coke Company, Newcastle, Cardiff, and Sheffield—know what is to be gained by specialized industrial departments. Also, they are out to help the Industry as a whole as well as themselves. The amount of good work they have done for the Industry is enormous, but the time has arrived when they cannot meet the needs of smaller undertakings. To attempt to do so would be to the detriment of their own business and eventually to the detriment of gas sales throughout the country. These undertakings are positively inundated with requests for help and information. However willing, they are unable to cope with the work. Similarly the B.C.G.A. cannot deal with the mass of inquiries from industrialists and manufacturers which reach the Association daily. The B.C.G.A. has its work to do; and no one can say that its work is not done splendidly in every way. But its activities are well defined; it is not equipped to deal with industrial business involving specialized technical knowledge and skilled research. It has done its best to meet the needs—ever-increasing needs—of the manufacturer. What information it has had at its command has, of course, been given freely. Other inquiries have been passed on to the larger undertakings mentioned for their help and advice, which again and again have been forthcoming. But the position has become unworkable and has involved an unfair, and now intolerable, burden on the "willing horses."

Universal Support Needed

THE best way out of the difficulty is that proposed by the three National Bodies. It is, indeed, the logical outcome of the Industrial Centres organized at Birmingham, Newcastle, and Cardiff—a development on the right lines, but which did not go far enough. These Industrial Centres have proved that vast opportunities lie before our Industry in the industrial and commercial fields, and that it only needs efficient organization to develop quite astonishing industrial loads. If anyone doubts this, we ask him to turn to later pages of the "JOURNAL" to-day, which contain a full report of the proceedings of the conference of the National Bodies, and to read the remarks of Mr. R. E. Gibson, Mr. A. W. Smith, Mr. T. P. Ridley, Mr. Ralph Halkett, and Mr. H. D. Madden. We shall play the fool unless we unite to secure this new business. Unless we act now AS AN INDUSTRY we shall make a present of our business to competitors—notably the oil industry.

We need a united front; and the new co-ordinated Development Centres need money. Those undertakings who hesitate to support this scheme, or who even refuse to lend their aid, will do a great disservice to the Gas Industry, besides stemming their own progress by adopting an unsound, unenlightened, uninspired attitude. It has to be borne in mind that each undertaking has a duty to the Industry as a whole. People judge the Industry by their experience of the particular undertaking supplying the area in which they either reside or carry on their business. Manufacturers will assess the virtues of gas by the service offered by the undertaking whose mains could deliver gaseous fuel to their factories and works. An unenterprising undertaking does in fact incalculable harm to the Gas Industry. It is a drag on its more energetic, more up-to-date neighbours. With the new scheme no undertaking can offer the excuse that it has not the facilities to deal with industrial and commercial inquiries, and is unable to afford the service which the industrialist to-day expects—and can obtain from our competitors.

We must sink little prejudices; we must work together. The scheme outlined at the conference last month deserves universal support. Granted this support, every undertaking will benefit. We do hope that there will be no "spongers"—undertakings willing to

accept the fruits of other undertakings' expenditure while unwilling to add a dime to the cost of the organization that yields those fruits.

We regard the new scheme of co-ordinated Gas Development Centres, with a Central Information Bureau, as one of the best advised moves ever made by our Industry; and though primarily for the development of our industrial and commercial business it will, we hope, spread its wings to cover the domestic load as well. Hats off to the enterprise and coats off to its fulfilment!

Neunkirchen—and After

A LETTER which Dr. Charles Carpenter contributes to this issue of the "JOURNAL" deals (as do others appearing along with it) with a subject that is still uppermost in the minds of all of us—a subject with which we shall feel for some time to come that it is the duty of experts to wrestle. Dr. Carpenter does us the honour of quoting from an editorial article which appeared in the "JOURNAL" as long ago as July 7, 1926. That article was written in connection with the Posen tankless holder explosion, and it must be admitted that the quotation was prophetic. Though at that time there were said to be nearly 100 holders of this type built, or being built, not one of them had been put up in this country. How different is the tale to-day. Dr. Carpenter says he knows of but one answer to the question of why the waterless holder has come to be used, and that answer is cheapness. This, however, does not appear to us to do justice to those engineers who have adopted the waterless system of storage. Mr. Frank Prentice, in giving an account of the Ipswich holder to the Institution of Gas Engineers in June, 1930, had a great deal more than this to say on the score of the advantages belonging to the waterless type. We reproduce the following sentences (they are not consecutive) from Mr. Prentice's paper as appearing in our issue dated June 11, 1930:

Pressure.

Where the waterless holder scores is in the absence of cups, and the consequent succession of sudden increases or decreases is absent. The importance of this also lies in the fact that during the period of the peak load the maximum pressure a holder will give is usually required; if during this period a drop of from 2 to 3 in. is experienced, due to uncupping, trouble occurs in the district.

All such fluctuations are absent with a waterless holder, and this is a strong point in its favour.

"Dri-Gas."

The introduction of this holder had a marked effect on the moisture carried forward by the gas in hot weather, and a considerable reduction of water in services and syphons was immediately apparent.

Another unlooked-for advantage became apparent in the reduction of our daily list of bad supplies, and we were able to dispense with three fitters on this work, a state of things that has continued ever since.

I am not arguing that this holder reduces the moisture in the gas, but I do say that, whatever the moisture content may be in the gas entering the holder, that, and no more, issues from it.

So certain am I of this advantage that I am now seriously considering a "Dri-Gas" plant; and if the advantages are proportionate to those already experienced, it will pay for itself in a very short time.

Cost.

So manifold are the advantages of this type that were I requiring a holder to-day I should certainly choose a waterless, even if I had to pay a rather higher price for it.

Again, there is the undoubted advantage of ease of inspection of the inner surfaces of the shell which are constantly lubricated by the sealing medium—an excellent preventive against corrosion. In view of the foregoing, therefore, we suggest that cheapness is not the only reason why the waterless holder has been adopted so widely in Great Britain and in other countries during the past few years.

Working Results of the London Gas Companies

AN analysis of the accounts of the three Metropolitan Companies and six of the Suburban Companies for the past year, compiled by Mr. F. J. Bradfield, the General Manager and Secretary of the Commercial Gas Company, appears elsewhere in this issue, and will doubtless be studied with interest, not only by the officials of the companies concerned, but also by those of other undertakings.

Having regard to the bad conditions of trade last year, it is very gratifying to notice that three Companies—Wandsworth, Tottenham, and Lea Bridge—were able to record an increase in the output of gas, while the reductions in the case of the other Companies cannot be said to be sufficient to cause any anxiety. The makes of gas per ton of coal compare very favourably with those for 1931, and Lea Bridge (with vertical retorts) again lead the way with 81·26 therms, followed by the South Metropolitan Company (with horizontal retorts) making 75·13 therms, while the Gas Light and Coke Company and Hornsey have increased their makes by nearly 1 therm per ton. Coke made for sale has been consistently good, and in the majority of cases shows little variation. Commercial are still the highest with 10·94 cwt., followed closely by Hornsey with 10·92 cwt., while as regards coal tar Lea Bridge are again top with a make of 15·96 gallons, and Croydon next with 12·65 gallons. There are some large differences in the figures for ammoniacal liquor, varying from 40·96 gallons in the case of the South Metropolitan Company to 15·48 gallons in the case of Wandsworth; but this is not surprising, having regard to the fact that it is unprofitable to make sulphate of ammonia.

Comparing the principal revenue account items per therm sold, it will be seen that the Gas Light and Coke Company's costs for coal and oil were cheaper than any other Company in the list at 3·16d., though the South Metropolitan Company (for coal only) is very little more at 3·19d. The Commercial Company again realized the most for residuals at 2·70d., with Hornsey next at 2·15d. In the resultant net cost of coal and oil, it is interesting to note that each of the three Metropolitan Companies is cheaper than any of the Suburban Companies; the Commercial being the lowest at 1·03d.

The total net expenditure per therm sold, governing as it does the price of gas, is always an interesting figure, and here Hornsey is the lowest at 7·26d., though the Gas Light and Coke Company and South Metropolitan Company come very close. Nearly all the Companies show a reduction in this figure compared with 1931, and of outstanding merit is a decrease of no less than 0·61d. in the Lea Bridge Company's costs.

The price realized for gas which, notwithstanding the flat rate, is the price actually charged, varies over the nine Companies from 7·91d. per therm by the Wandsworth and Hornsey Companies to 9·08d. by the South Suburban Company. The flat rate charged by all the Companies in their principal areas of supply has remained constant throughout the year. As regards the rentals, there are two items which materially affect the relationship between the net expenditure and the gas receipts—viz., the high amount charged per therm for rental of meters by the Wandsworth Company and the rental of stoves by the Tottenham Company.

The sundry figures at the bottom of the analysis show that, compared with 1931, coal has cost less per ton in practically all cases, the largest variation being a reduction of 1s. per ton by the South Suburban Company. The net receipts from coke per ton were also less, except in the case of the Hornsey Company, while eight out of the nine Companies were able to record a satisfactory increase in the amount realized per gallon of tar.

CORRESPONDENCE

THE NEUNKIRCHEN EXPLOSION

Dr. Carpenter's Views.

SIR,—The newspaper accounts of the explosion at Neunkirchen indicated so serious a state of affairs that it seemed important that a competent and impartial investigation should be made upon the spot with as little delay as possible. For this purpose Messrs. F. H. Vince and Vernon Simmonds were dispatched to visit the scene of the disaster within a week of its occurrence. They were most courteously received at the Neunkirchen Ironworks, where the holder was situated, by its officials there, who readily interrupted their work of salvage and reconstruction to give them the fullest possible details of the disaster, and I desire to acknowledge our great indebtedness to these gentlemen for placing the cause of the disaster beyond doubt.

From the report of Messrs. Vince and Simmonds it would appear that the trouble arose as follows: A length of about 33 yards of 25-in. steel main which had been taken out for cleaning purposes was being replaced between, at one end, a valve near the holder inlet and, at the other, a temporary blank flange. A cradle carrying and rivetted to the main was found to be in the way, and a fitter proceeded to cut this off the rivets and thus facilitate its removal. Owing probably to the valve referred to letting by gas an explosive mixture formed in the main and a spark from the hammer or chisel ignited and exploded it (a later explanation suggests the use of a blow-pipe).

Up to this point the accident was one which might have happened in certain circumstances in any gas-works. Unfortunately, however, the force of the explosion damaged the outlet pipe from the holder, and before the outlet valve situated close to the shell could be closed, the escaping gas fired, flared up with a long flame alongside the holder, destroying first the piston seal, and then firing through the hot shell the explosive mixture above the diaphragm. The holder burst horizontally in all directions, the piston coming to rest at the bottom, and the umbrella falling to the ground a few yards away, not blown to a distance as described earlier in the Press.

The preliminaries of the accident might have happened, as I have said, on any works with any main and to any holder, but the disastrous results are traceable to the fact that the holder was a waterless and not a water-sealed one. In the latter case the gas might have escaped, fired, and burnt harmlessly away without damaging life or limb or even property other than the holder itself. You yourself, Mr. Editor, foretold very clearly what might happen in your editorial of July 7, 1926, dealing with a holder of the type in question; and I venture to suggest it might well be re-printed. From your article I extract the sentence following:

> "Anyway, there is a seat of a risk which does not obtain in gasholders of ordinary construction. With an explosion in a holder of the tankless form, there is little chance of preventing serious disaster to the structure itself; and we can conceive a holder of the kind, located in a densely populated district, in the event of such a catastrophe, doing damage of an order which it would not be pleasant to contemplate."

There is no shadow of doubt that an added risk exists with the waterless holder from which the older type is free. Why therefore has the newer kind come to be in use? I know of but one answer and one alone—Cheapness.

I will not ask if the risk is worth it; no responsible gas engineer, or Board of Directors, has any right to consider that. It is my opinion that any Board or any engineer who from the date of Neunkirchen takes the responsibility of recommending or accepting a gasholder of the waterless type is accepting a very grave responsibility.

The report of Messrs. Vince and Simmonds is being printed, and a copy will be at the disposal of any responsible engineer who writes for one to the "Chief Engineering Clerk" at the address below. But I would urge it as the duty of every gas engineer whose care comprises a holder of this character to go to Neunkirchen and see for himself what a disaster of this kind would mean translated into the conditions of his own gasholder-station environment.

Yours, &c.,

CHARLES CARPENTER.

South Metropolitan Gas Company,
709, Old Kent Road, S.E. 15,
Feb. 27, 1933.

SIR,—In connection with the disastrous explosion at Neunkirchen, I have read with interest the reports given in your issue of Feb. 22, but I cannot agree with the last sentence given in "An Official View," which reads as follows:

> "The result would undoubtedly have been the same in the case of any gasholder, irrespective of the system employed."

If the main explosion was caused by deformation of the shell of the gasholder due to its getting red hot from the external flame, destroying the seal and allowing gas to get above the piston and thus igniting the gas and air mixture inside, then, in the case of a similar flame external to a column-guided or spiral-guide gasholder, there would not be the same result, because inside the gasholder there would only be gas which could only ignite by a hole being caused in the plates. Even then the pressure of the gasholder would simply cause a burning of the gas external to the gasholder with a gradual fall of the bell due to the escape of the gas.

I suggest that the sequence of events might have been just a little different from those mentioned in the reports. I understand that in a waterless gasholder there are some ventilating or gas-escape holes near the top of the shell, and it is possible that the external flame—which, according to the report in your issue of Feb. 15, played on the side of the gasholder to a height of 250 ft. for several minutes—actually ignited the inside mixture of gas and air through these ventilator openings, or the heat could crack and break the glass windows and thus cause ignition.

This possibility seems to have been overlooked in the preliminary reports which have been published by you, but it may possibly have been considered at the inquiry which is being held.

Yours, &c.,

WILLIAM BLAKELEY, M.Inst.Gas E.

Firth Blakeley, Sons & Co., Ltd.,
Church Fenton, Leeds,
Feb. 27, 1933.

SIR,—Although nothing should be said or written to magnify the lamentable results of the above explosion, or increase the misgivings of people residing close to gasholders, still, at the same time, a reassurance should be offered to people in close proximity to gasholders constructed on the normal British principle. The last paragraph of the report of the M.A.N. investigations published on p. 462 of the current issue of your "JOURNAL" contains a sentence which is quite untrue, and, if uncontradicted, will undoubtedly lead to unwarrantable fears in a lot of people. The paragraph states that "the results would undoubtedly have been the same in the case of any gasholder, irrespective of the system employed."

Now it is well known to any gas engineer that an ordinary water-sealed gasholder, erected in a water tank, cannot be exploded by any external means. The utmost damage that could occur would be the burning of the gas, and the

possible collapse of the holder. There is no chance of any explosive mixture forming in a water-sealed gasholder when being used for the storage of gas.

I would ask you to publish this letter, so that no undue anxiety may be felt for the safety of our British gasholders.

Yours, &c.,
"PRO BONO PUBLICO."

Feb. 24, 1933.

Control of Retort Bench Vacuum.

SIR,—I have read with interest Mr. Campbell's paper, "Control of Retort Bench Vacuum," published in the issue of the "JOURNAL" for Jan. 18. The remarks which interested me most were those referring to the Arca regulator.

At Shipley one of these regulators has been in use for the last two and a half years and has given very satisfactory results—control to within $\frac{1}{10}$ in.

The carbonizing plant at Shipley consists of a Woodall-Duckham battery setting of twelve 6-ton retorts. There are two collecting mains, six retorts leading into each. The foul mains from these collecting mains are joined together, thus forming one common foul main in which the governor butterfly valve is fixed.

I have found that for any setting of the regulator even conditions are obtainable at all retorts, no matter which particular ones are working. For instance, six retorts may be working on one collecting main and only one on the other collecting main, and yet the conditions of "pull" are the same on each retort. In view of this I was surprised to read that Mr. Campbell had to resort to the use of the main gas valves on the collecting main.

I noticed in the report of the discussion that Mr. Greig, of Glasgow, states that the re-adjustment of the regulator was necessary when material changes in the volume of gas occurred. Personally I have not found this to be the case, as I can drop one or more retorts for scurfing and still maintain the same "pull" conditions. The volume of gas made per retort is 4000 c.ft. per hour, and therefore I think one can call such a volume a large one when the total hourly make is about 30,000 c.ft.

The trouble that Mr. Greig had with a corroded diaphragm plate interested me, as I have had the same trouble at Shipley. To prevent the recurrence of this trouble I continued the impulse pipe down from the diaphragm chamber to a small seal pot. This is kept full by the waste water from the regulator. When it was found necessary to replace the corroded diaphragm an aluminium one could not be obtained quickly enough and so one made of tin plate was obtained and fitted. This heavier plate made no difference to the working of the regulator. It has now been in position for eighteen months and is still as good as new; and therefore I think it is unnecessary to use aluminium diaphragm plates.

Mr. Campbell says he had trouble at one time with rust in the relay mechanism. This was also experienced at Shipley. To obviate this a galvanized iron pipe was substituted for the iron one conveying the actuating water to the relay. The filter is now flushed out once a week by reversing the water flow through it and away to waste. At the top of the filter chamber a cock has been fitted, and after flushing this is opened to make sure that there are no air locks in the water line. When the instrument was first put to work at Shipley trouble was experienced with sticking of the piston valve of the relay. This was traced to the action of the town's water upon the brass piston and seating. This has been overcome now by the fitting of a high percentage nickel alloy piston in place of the brass one.

From my experience of this regulator I think the following points are essential to the efficient working of an Arca regulator:

(1) Care in fitting up—such as ensuring that the wire from the quadrant of the butterfly is tangential to it and in correct alignment with the hydraulic cylinder piston rod.

(2) On no account should ordinary iron piping be used for the water supply; it should be galvanized iron or copper.

(3) An efficient liquor spray should be fitted close to the butterfly valve.

Yours, &c.,
F. S. DOWNS,
Technical Assistant.

Shipley U.D.C. Gas-Works,
Feb. 20, 1933.

Combustion of Producer Gas.

SIR,—In the "JOURNAL" Technical Record for Jan. 11, 1933, there is an extract from a paper on "Combustion of Solid, Liquid, and Gaseous Industrial Fuels," which was given before the East Midlands Section of the Institute of Fuel on Dec. 9, 1932.

In the first part of the paper dealing with the combustion of a given sample of producer gas the author arrives at the conclusion that the maximum CO_2 obtainable is 24·4%. He reaches this conclusion thus:

The volume of dry products	CO_2	N_2
	33 vols.	135 vols
	24·4%	75·6%
	100%	

I beg to point out that this calculation contains an arithmetical error, and should read:

The volume of dry products	CO_2	N_2
	33	135
	19·6%	80·4%
	100%	

In this case the maximum CO_2 obtainable is 19·6%.

Yours, &c.,
L. W. ROBERTS.

Harrogate Gas Company,
Feb. 22, 1933.

Why Not a Women's Gas Association?

SIR,—Those of us connected with the Gas Industry complain, and with justification, that public money ought not to be spent in subsidizing electricity, and that both industries should be permitted to compete on even terms in offering their services to the public. It is surely reasonable to insist that every industry should stand on its own legs.

To be perfectly candid, however, we must compliment those engaged in the electricity industry upon their enthusiasm and enterprise, and one of the best moves they ever made was in enlisting the services of the women on their side. The formation of an Electrical Association for Women must have resulted in a vast amount of business being secured for electricity. Why should not the Gas Industry follow suit and formulate a Women's Gas Association? After all, the use of gas is mainly a woman's job, and there is no doubt a large amount of business could be obtained.

What I would suggest would be the formation of various branches in different towns, and there should be no difficulty in obtaining the services of very capable lecturers.

I am quite aware that demonstrations are held periodically in various towns by different gas undertakings, but what is wanted is a sound organization with a lead from the British Commercial Gas Association and a sound backing from all those engaged in the Gas Industry.

The electrical appliance manufacturers and suppliers have spared no effort to make their Women's Association a success, and it is up to the Gas Industry to get a move on.

Yours, &c.,
D. A. PRATT.

73, *Holgate Road,*
York,
Feb. 25, 1933.

PERSONAL

Mr. FRANK PLATT has been appointed Engineer and Manager of the Hayfield Gas Company, Ltd., near Stockport.

* * *

Mr. ERIC FIELD, Engineering Assistant at the Blackburn Corporation Gas Department, has been appointed Works Superintendent, succeeding Mr. J. D. Ashworth, who recently became Gas Engineer in succession to Mr. G. P. Mitchell. Mr. Field is an old boy of Blackburn Grammar School and Giggleswick School, and before entering the Gas Department six years ago received a three years' engineering training. He was appointed Engineering Assistant in 1931.

* * *

Alderman GEORGE CLARK, of Chesterfield, who has been elected to the aldermanic bench of the Derbyshire County Council, is a Vice-President of the British Commercial Gas Association and has been Chairman of the Society of British Gas Industries.

THE NEWS OF THE WEEK

The Western District of the Southern Association will meet on March 16, at 2.30 p.m., at the Offices of the Exeter Gas Company. The subject for discussion is "Insurance as Affecting Gas-Works."

Sanction to Borrow £6000 for the laying of new gas mains has been received by the Darlington Town Council. The Council has decided to give a rebate of 10% in the charges for gas during the present quarter.

The Smethwick Corporation have an excellent stand at the British Industries Fair at Castle Bromwich. Naturally gas is well featured, for Smethwick was the birthplace of the Gas Industry; and it is not surprising that in the borough gas is used extensively for industrial purposes.

Councillor Geoffrey H. Kitson, Chairman of the City of Leeds Gas Department and Immediate Past President of the B.C.G.A., will be addressing the members of the Scottish Junior Gas Association at their meeting in Glasgow on Saturday next, in the absence of Sir Francis Goodenough.

A Useful Pictorial Representation of the main principles underlying the waterless and the water-tank types of gasholder was published in the "Illustrated London News" for Feb. 25. The artist was G. H. Davis, who based his drawings on information supplied by the Gas Light and Coke Company.

At the B.I.F. in Birmingham one of the noteworthy features of the Gas Industries Section is the excellence of the gas lighting as a whole and of the individual stands. The stand of Radiation Limited, for example, is floodlighted by gas, eighteen lamps being employed giving a total of 12,000 c.p.

Centrifugal Fans, and their relation to air circuits, is the subject of a paper to be read by Mr. P. Wyllie Kerr, A.M.I.Mech.E., before the Institution of Heating and Ventilating Engineers at their sessional meeting to-day, at 7 p.m., in the Lecture Room, Home Office Industrial Museum, Horseferry Road, S.W. 1.

South-Eastern Gas Corporation, Ltd., announce that, as a result of the offer made to the shareholders and stockholders of the Maidstone Gas Company—see last week's "JOURNAL"—acceptances have already been received in excess of the minimum quantity required, and that the offer has therefore become effective.

The Aims and Policy of the Coal Utilization Council, of Columbia House, W.C. 2, are set out in a booklet recently issued. Under the headings of market investigations, the overseas market, propaganda, and the national importance of the Council's work, the booklet gives a very clear idea of what the organization sets out to do.

The Cookery and Washing Demonstration staged by the Leeds Gas Department in the Town Hall on Feb. 7, and referred to in the "JOURNAL" for Feb. 15, was highly successful. Approximately 1800 ladies accepted invitations to be present. This must be one of the largest cookery demonstrations ever held. The demonstrator was Miss Kirby.

Cheaper Gas at Blyth.—The Directors of the Blyth Gas Company have decided to reduce the price of gas by 1d. per 1000 c.ft., after the March readings of the meters. The reduction will bring the price for rented meters in Blyth to 3s. 3d. per 1000 c.ft. and 3s. 9d. in Bedlington. A discount of 1d. per 1000 c.ft. will be made to users of prepayment meters.

The Running of Omnibuses by Compressed Gas is being considered by the Accrington District Gas Board, the Accrington Corporation, and the Lancashire Foundry Coke Company. The Accrington Corporation abandoned electrical tramcars some time ago, but the Transport Committee are finding petrol-driven omnibuses an expensive service. There is no likelihood of any reversion to electrical propulsion, and the one offering most possibilities is thought to be compressed gas.

Plymouth and Stonehouse Gas Company throughout the week ended Saturday, Feb. 25, gave practical demonstrations at their showrooms of gas-heated catering and hotel equipment, an expert being in attendance for the purpose.

In Connection with the B.I.F., the Parkinson Stove Company, Ltd., of Stechford, Birmingham, have specially prepared a little brochure, copies of which were despatched to every gas undertaking in the country. It contains brief particulars of some of the firm's latest lines as well as of well-known standard lines, with space left available for the visitor's own notes.

Robberies from Gas Meters.—The Chief Constable of Leamington stated at the local police court on Feb. 13 that in recent months there had been an "epidemic" of robberies from gas meters in the town. The meters were often fixed in places which offered temptation, but it was a particularly mean type of theft, because people had to pay the money to the gas company.

Fire Broke Out recently at the meter stores above the workshops of the Halifax Corporation Gas-Works in Mulcture Hall Road. The outbreak is believed to have been due to spontaneous combustion among a quantity of sawdust spread around two tanks of caustic soda, to absorb any spilled liquid. When the fire brigade were summoned they found the meter store floor well alight, but there was not much difficulty in quelling the outbreak, the only damage being the destruction of about 30 ft. of flooring.

A Successful Gas Exhibition and series of cookery lectures have been run by the Ballymena Gas Department in conjunction with Radiation Limited. So much interest was shown in the exhibit and the attendance was so good at the cookery demonstrations that the exhibition, opened on Feb. 13 and intended to be closed on Feb. 17, was carried on until the following Tuesday. Over 1500 persons attended the lectures, conducted by Miss U. H. Barnett, of Radiation Limited, and a large number of appliances, lighting fittings, and gas switches were sold to consumers.

A Larger Company than Ever attended the Annual Dinner last Friday of the Employees' Social Association of the Gravesend and Milton Gas Light and Coke Company. Mr. W. A. Howie (Engineer and Manager) presided, while among those present were Mr. George Sandford, J.P. (Chairman of Directors), together with other Directors, Mr. L. C. Troughton (Secretary), and other senior officers of the Company. The toast of the Company was submitted by Mr. W. A. Hammond and responded to by Mr. Sandford. Capt. C. Tuff, J.P., C.C. (Director), was responsible for the toast of the Employees' Social Association, to which Mr. Howie responded. An enjoyable concert concluded the evening.

Society of British Gas Industries.

A Meeting of the Council was held at 56, Victoria Street, Westminster, S.W. 1, on Feb. 16—Mr. E. J. Fox, the Chairman, presiding. Those present were: Mr. H. E. Bennet (Vice-Chairman), Dr. E. W. Smith, Messrs. Frank West, C. S. Bennett, C. A. Goodall, T. F. C. Potterton, F. J. Gould (Hon. Treasurer), E. J. Davidson (Hon. Secretary), and Arthur L. Griffith (Secretary). Apologies for absence were reported from Messrs. A. Comley, W. J. Gardner, W. H. Handley, B. B. Waller, L. Hartley, T. O. Wilton, and H. M. Thornton.

It was agreed to offer prizes of Five Guineas and Two Guineas to the first and second candidates in the Minor Examinations in Gas-Works Practice, Gas Supply Practice, and Final Examination in Gas Fitting for the Session 1933-34 as last year.

At the request of the British Standards Institution the following were appointed additional members of the Gas Industry Committee: Alderman George Clarke, J.P., and Messrs. T. F. C. Potterton, Ernest West, Philip H. Sugg,

and H. M. Thornton, J.P.—thus increasing the Society's representatives to ten members.

Arrangements were made for the Annual General Meeting and Dinner to be held at the Hotel Metropole, London, on Thursday, May 11, under the Presidency of the Right Hon. L. S. Amery, M.P.

Hornsey Gas Company.

Directors' Report for 1932.

The sale of gas during the year is less than that for 1931 by 4·8%. The revenue account shows a profit for the year of £29,445 8s. 11d., against which has been charged interest on debenture stock, &c., a transfer of £5000 to the contributory pensions fund, and interim dividends of £10,041 16s. These items amount to £18,458 17s. 10d. The balance £10,986 11s. 1d. added to the sum of £23,880 10s. 5d. brought forward from last year's account shows a sum of £34,867 1s. 6d. to the credit of the Company.

For the half-year ended Dec. 31, 1932, the Directors recommend the payment of the following dividends, less income-tax—viz., the statutory dividend on the 5% preference stock; dividends at the rate of 7½% per annum on the 5% stock, and at the rate of 6% per annum on the 3½% stock (making with the interim dividends already paid on the 5% stock and 3½% stock respectively, 7½% and 6% for the year), amounting together to £10,041 16s. A balance of £24,825 5s. 1d. will remain to be carried forward to the next year's account.

The Directors report with regret the death of Mr. Thomas William Seager Berry, who was a member of the Board for a period of eight years. The Directors have appointed Mr. J. W. Buckley, M.Inst.C.E., to fill the vacancy so created, on his retirement from the offices of Engineer and General Manager, positions which he had occupied for twenty-four years.

New Showrooms Opened at Lurgan.

The Lurgan Urban Council's new gas showrooms, which cost £2240, were formally opened on Feb. 20. Mr. H. C. Malcolm, Vice-Chairman of the Council, who presided, said that 80 million c.ft. of gas were sold each year, and there were 3100 consumers, while 4946 appliances were being used in the town. From that it would seem that the advent of electricity had not harmed the gas sales, but that, on the contrary, the friendly rivalry had been beneficial to both services. The motive force behind the continued success of the Department was undoubtedly their Manager Mr. Wilfrid Tallentire, whose father had come to Lurgan as Manager in 1874, to be succeeded fifteen years later by his son. The present good state of the Undertaking was attributable to his zeal, energy, and ability. He was now assisted by his son, Mr. Thomas Tallentire.

The building was then formally opened by Mrs. Greer, Woodvale.

Mr. J. D. Smith, Engineer, Manager, and Secretary of the Belfast Gas Department, complimented Lurgan on the possession of so up-to-date a gas undertaking, and on having as Manager his friend Mr. Tallentire, whom he regarded as one of the pioneers in that connection.

A demonstration of gas cooking was given to a very large audience by Miss J. D. Baker, of Radiation Ltd.

Forthcoming South London Exhibition.

The Crystal Palace will become London's biggest and most appealing shop window when Viscount Hailsham, Secretary of State for War, opens the third annual South London Exhibition there on Wednesday, March 8. Mr. J. H. Thomas, M.P., will preside.

Two hundred brilliant exhibits and a host of special features in a superb setting covering 5 acres of floor space and occupying nearly three miles of stands will be the attractive menu offered for the enjoyment of homelovers.

The familiar interior of the Crystal Palace is now being transformed into a world of gaily illuminated avenues and gardens schemed with all the artistry of the most brilliant modern exhibitions. In the panorama of exhibits extending through three great halls will be found the most representative display ever staged at the Palace of the finest and newest products of British manufacturers, Empire exporters, and enterprising London traders.

The South London Gas Exhibit will again be a prominent feature of the Exhibition, which remains open until March 18 (2 p.m. to 10 p.m. daily).

THE NEWS—continued.

Magnitude of the Gas Industry.

A booklet by the Gas Industry Information Bureau at Castle Bromwich gives interesting figures relating to the magnitude of our Industry:

113,000 people are regularly employed in the Gas Industry.

The capital invested in the Industry is about £200,000,000.

18 million tons of coal are carbonized annually in British gas-works.

The production of this coal gives employment to about 67,000 mine-workers.

10 million consumers regularly use some 1600 million therms of gas a year.

50,000 miles of mains carry this fuel unfailingly to them.

7 million British housewives cook by gas.

Three out of every four doctors all over the country use gas fires.

Four out of every five nursing homes and three out of every four hospitals use gas for heating.

Altogether the medical profession accounts for about 100,000 gas fires.

3000 trades use gas, for an average of seven processes in each.

The bye-products obtained yearly from British gas-works include:

12 million tons of coke.
126,000 tons of sulphate of ammonia.
215 million gallons of tar.

Evening Star Lodge—Ladies' Festival.

A most enjoyable Ladies' Festival of the Evening Star Lodge, No. 1719, was held on Feb. 10 in the Edward VII. Suite of the Hotel Victoria, London—the Worshipful Master, W.Bro. T. F. C. Potterton, and Mrs. Potterton receiving the Brethren and their guests. The Companions of the Evening Star Chapter were also invited to attend, and many of them did so, with their friends, masonic and otherwise.

After dinner the evening's programme, consisting of an excellent cabaret, interspersed with dancing, proceeded until 11 o'clock, after which dancing was continued until 1.30 a.m.

The arrangements for the evening were admirably organized by W.Bro. A. L. Croager, assisted by the members of the Festival Committee, including W.Bro. Rae P. Normand, Secretary of the Lodge.

The Toast of "The Ladies" was proposed by the Worshipful Master and replied to by Miss Potterton, who thanked the Brethren for the beautiful souvenirs presented to the ladies. The toast of "The Worshipful Master" was proposed by W.Bro. E. J. Fox.

A Twenty-four-Hour Day Service.

Messrs. Bell's Asbestos and Engineering Supplies, Ltd., of Bestobell Works, Slough, have just taken what they believe is a unique step towards the servicing of the engineering industry.

Summed up in a few words, they are going to maintain a day and night service, Sundays and Bank Holidays included, in order that any industrial concern, from a steam-using laundry to a big manufacturing works, may be able to obtain instant attention in the event of a breakdown of through a shortage of materials of the type they are able to supply.

The scheme has, of course, a certain advertising value, lieve is a unique step towards the servicing of the engineering industry.

The Public Utilities Combine.

After some nine or ten years of informal co-operation the National Associations representing the interests of Gas, Water, Electricity, Tramways and Light Railways, and Hydraulic Power Undertakings, with an aggregate capital of approximately £1,000,000,000, have combined as a "Conjoint Conference of Public Utility Associations" under a written constitution with the object, among others, of setting up a defensive and, if needs be, an offensive alliance for the purpose of safeguarding and fostering the common interests of the Public Utilities named. The main purpose of the Conjoint Conference is to afford a ready means of enabling representatives to get together quickly, in order,

THE NEWS—continued.

if necessary, to take combined action whether in Parliament, in the Law Courts, or elsewhere.

The Conference have been fortunate in securing the acceptance of the Presidency by Lord Mount Temple, P.C., J.P., D.L., and Vice-Presidencies have been accepted by Viscount Falmouth, Member of the London and Home Counties Joint Electricity Authority, Sir David Milne-Watson, LL.D., D.L., President of the National Gas Council of Great Britain and Ireland and Governor of the Gas Light and Coke Company, and by Mr. William Cash, F.C.A., J.P., Chairman of the Bournemouth and Barnet Gas and Water Companies.

An Executive Committee has been appointed, with Alderman A. R. Atkey, J.P., Chairman of the Nottingham Corporation Water Committee and Past Chairman of the British Waterworks Association, as the first Chairman, with two Vice-Chairmen, Mr. Stephen Lacey, B.Sc., M.Inst.C.E., Distributing Engineer of the Gas Light and Coke Company, and Mr. W. B. Woodhouse, M.Inst.C.E., M.I.E.E., Engineer and Manager of the Yorkshire Electric Power Company, representing the Incorporated Association of Electric Power Companies. There are two Hon. Secretaries, Lieut.-Col. Sholto S. Ogilvie, D.S.O., Joint Manager of the National Gas Council, and Mr. G. P. Warner Terry, Barrister-at-Law, Secretary of the British Waterworks Association.

In the past the Conference, though informal in character, has performed much useful service for its constituent members, and now that it has been re-organized and has obtained the services of a powerful and thoroughly representative executive, it will be able to make its influence felt in a still greater degree in furthering the common interests of the great public utility services, the welfare of which is of such vital importance to the community at large.

German Gasholder Accident.

A fully attended meeting of the Gasholder Sub-Committee of the Institution of Gas Engineers was held at 28, Grosvenor Gardens, London, S.W. 1, on Feb. 27.

Consideration was given to the several reports submitted to the Sub-Committee on the causes of the accident involving the waterless gasholder at Neunkirchen, and it was arranged to hold a further meeting as soon as the report of the official inquiry becomes available.

From the present information before the Committee, it is concluded that the accident did not originate from any defect in the gasholder.

Modern Commercial Photogravure.

Some excellent literature is produced by, and on behalf of, the Gas Industry, and as time goes on there will be incessant striving to reach still greater heights in this respect. In connection with these efforts a reminder may be welcome of the possibilities of modern commercial photogravure. To own a copy of the "Rembrandt Review" is to possess an album of great artistic merit, the aim of which is to give some indication of the ways in which photogravure may be made the means of rendering printed matter more effective and productive of greater returns than hitherto. Messrs. Rembrandt Photogravure, Ltd., of Drury House, Russell Street, London, W.C. 2, are engaged on valuable, as well as beautiful, work.

The British Manufacturers' Red Book.

The Red Book of the National Union of Manufacturers, of 6, Holborn Viaduct, E.C. 1, just published, is a descriptive and classified directory of members of an Association formed in 1915 to safeguard and promote the interests of British manufacturers. It is one of the two national associations recognized by the Government as representing the collective views of manufacturers.

The Red Book retains all the features which, during the past eighteen years, have made it a valuable work of reference to all who require well arranged and comprehensive data regarding British manufacturers and their products. Not only in the United Kingdom, but in all parts of the Empire and in every foreign country engaged in commerce with Great Britain, the Red Book has come to be regarded as the standard guide to British goods and the manufacturers who produce them.

It is gratifying to find that in these difficult times there is no apparent reduction in the number of pages allocated to the list of members. One valuable addition to the new volume is a preface setting out very clearly the policy of British manufacturers as expressed through the Union.

Coal Tar Naphthas.

Copies of the recently issued British Standard Specifications for Coal Tar Naphthas (Coal Tar Solvent Naphtha, Heavy Coal Tar Naphtha, and Heavy Coal Tar Naphtha (Unrectified)) (No. 479-1933) may be obtained, price 2s. each, from the Secretary, Institution of Gas Engineers, 28, Grosvenor Gardens, London, S.W. 1.

A Warm City.

The estimated gas consumption at the White City during the run of the British Industries Fair is 12 million c.ft.—as much as the town of Bude uses in a whole year!

Two miles of hot water pipes, which are supplied from ten gas-fired central heating boilers, run around the exhibition halls. In addition, 900 gas fires are blazing away merrily, and there are 160 gas radiators. Gas is making the White City a warm city, whatever the weather outside.

But gas has other duties as well at the White City. The restaurants and cafés necessary to feed the multitude of visitors are equipped with up-to-date gas appliances, and constant hot water is ensured in the cloakrooms by the presence of twelve instantaneous gas water heaters.

Gas Coke in the Open Firegrate.

An interesting letter on the use of gas coke in the open firegrate was contributed to "The Times" of Thursday last by Mr. Max Baker, of Clacton-on-Sea. This is what he had to say:

During the past twenty or thirty years you have devoted such an enormous amount of space to the furtherance of smoke prevention that I have often felt tempted to communicate my own researches on the subject. Your splendid article, "Cheap Smokeless Fuel: Hope of Benefit to the Poor," crystallizes temptation into action. If I may be allowed to say so, my work is of more real practical importance than all the strivings of the Fuel Research Board. The need has never been smokeless fuel, but of means to use it in the domestic sphere. According to the methods I observe, without having devised them, the installation of coke-burning stoves or grates is a positive boon.

Away back in 1913 one of your articles led me to observe the action of coke as burnt by the wayside in baskets, even in mere buckets pierced with plentiful holes. Obviously coke needs an energetic draught, also a fuel receptacle about twice that appropriate for coal to take account of the fact that it is twice as bulky for the same weight. The next stage was to search a builder's yard in order to find an open stove satisfying the conditions imposed; luck produced the very thing. It was installed and has been in continuous use ever since; its fires have compelled the admiration and envy of every beholder, without a single exception. Later a duplicate was purchased for another room, but is not quite so satisfactory, through being a size smaller. Of the larger a working man remarked what a boon such a fire would be in the house of one of his kind—warmth unlimited, cheeriness, and considerable versatility in cooking. Its chronic state is the all-redness which coal fires attain for brief periods after careful stoking.

Six conditions are essential for the satisfactory burning of coke in an open fire:

(1) An unusually large fire basket.
(2) A hood or canopy not more than 8 in. above the top bar, this to concentrate the suction of the chimney on the fire.
(3) A lid or cover for closing this 8-in. space to assist lighting and draw up the fire when burnt low.
(4) L-shaped fire-bars, narrow and less than ½ in. apart, vertical in front, and containing beneath without break, the effect being that bottom and front are simultaneously cleared of the dust to which coke reduces.
(5) If the stove is devised for part convected, part radiant heat a completely sealed flue to ensure the entire chimney suction acting on the fire.
(6) Dry coke—if possible, bought dry; if not, stored under cover before use.

In practical use the fire needs a half-shovel of coal nuts to assist lighting; after that coke alone sustains an incandescent mass. With a properly sealed draught there are no fumes, as may be proved by rubber or sulphur on the fire. Downdraught has to be very bad to overpower the rising column of heat in the chimney. Should the fire burn very low, a small log of wood is desirable before re-

fuelling. Banked up it lasts for hours on slow-combustion principles due to the clogging action of the dusty ash.

To summarize, we have here a continuous twenty years' experience of satisfactory open fires burning common gas coke to heat large rooms of north-east aspect, no trouble of any sort, rooms quickly heated at low cost, with never an indication at the chimney-pot of the comfort below. How, then, can this boon become more widespread? I ask this question advisedly because from previous experience I know that a letter of this sort promotes numerous inquiries. The maker's name is unknown to me; he operates somewhere on the banks of the Clyde. What really is needed is for some interested authority to verify my statements and set in motion the machinery necessary for producing models of stove and fireplace such as would place within reach of the million the double benefit of a comfortable interior and a relatively uncontaminated exterior. My best help goes without saying, the more so because the stoves, as bought, were far from perfect and few but myself would have attempted and carried through the necessary reconditioning.

A New Monthly Journal.

The Institution of Heating and Ventilating Engineers, in order to keep its members more up-to-date with the Institution's work, has decided to issue a monthly Journal instead of its annual Volume of Proceedings.

This new Journal, available to members only (or exchange with allied Societies and technical journals) will publish reports of the proceedings and papers presented at the Institution meetings. It is proposed to devote space to investigations connected with heating, ventilating, and allied subjects carried out at the Building Research Station of the Government's Department of Scientific and Industrial Research. Another feature will be abstracts, or index, of articles appearing in the Technical Press, &c., and book reviews, to keep the members *au fait* with engineering progress. The first issue will appear this month.

The Vulcan Cook Book.

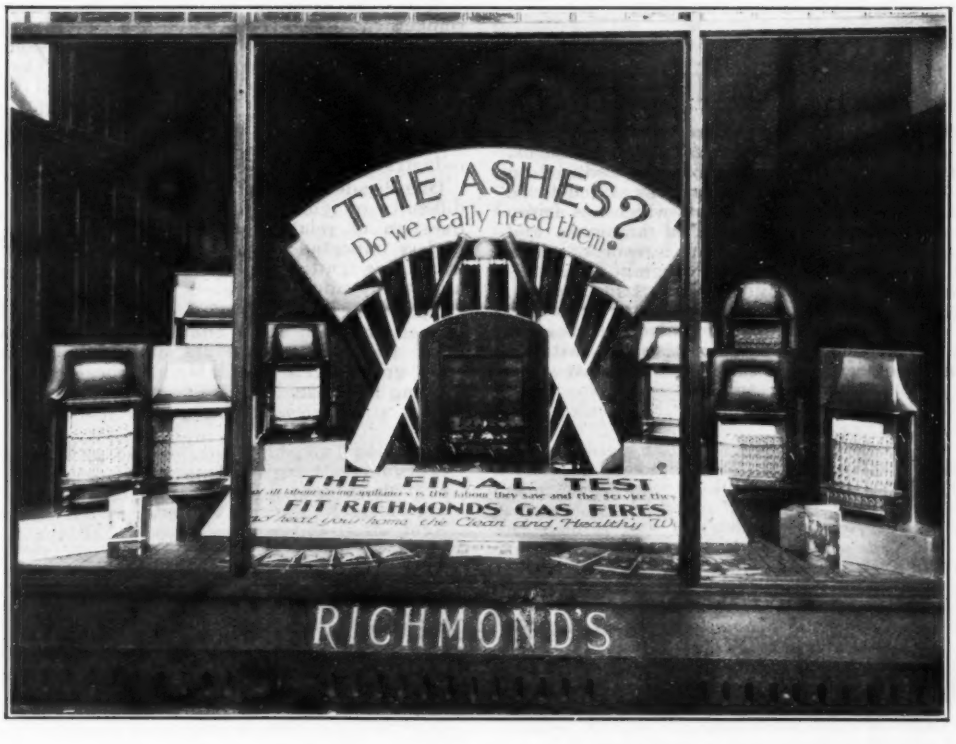
The Vulcan Cook Book, compiled by Mrs. D. D. Cottington Taylor, is not only a most useful, but a most attractive and interesting publication. The delicacies depicted on the front cover alone are sufficient to impel one to delve further in the hope of discovering how it may be possible for such dishes to appear on one's own table.

And surprisingly simple it is, too, with the assistance of this cookery book and a Vulcan " Equi-Heat " gas cooker, to prepare a banquet even for the most exacting gourmet.

At the outset the book devotes several pages to the proper care and maintenance of the gas cooker, giving details of the construction and operation of the Vulcan " Equi-Heat " model—a very pleasing appliance finished in mottled enamel and complete with the new glass-fronted oven-door, recently adopted by the makers (the Vulcan Stove Company, Ltd., of Exeter).

From time to time gas cookers have appeared with glass doors, but they have not met with much success owing to the glass steaming over and losing its transparency just when it should have been of service. After long and careful research, it is claimed that the " Armourplate " glass-panelled door overcomes the difficulty by reason of the double-glass, with an intervening air space, obviating condensation of moisture on the glass. No loss of heat occurs through the glass door, as the air space is an excellent insulating agent. The " Armourplate " glass also resists

The "Final Test"



Here is another topical window display arranged by Richmond's Gas Stove Company, Ltd., in their Queen Victoria Street Showrooms. This was put in on the morning on which the first day's news of the final Test Match in Australia came through, and the way in which this sports event has been connected with gas fires attracted much attention. This is yet another example of how topical events can be utilized to draw attention to the advantages of gas.

THE NEWS—continued.

sudden changes and wide differences in temperature, and can withstand heavy blows and jars.

The recipes noted in the following pages of the cookery book are many and varied, including a wide range of normal dishes as well as a selection of the most delicious specialities. The art photographs interspersed throughout the book add to the attractiveness of the work and go to show that cooking is no longer one of the housewife's drudgeries, but an art—and a very skilful art—in itself.

The book, it should be mentioned, is usefully sectionalized under a number of headings, among them being the Theory and Practice of Jam-Making, which includes a valuable section on Fruit and Vegetable Bottling, with a time-table for sterilizing bottled fruits and the strength of syrup to use. A comprehensive index to the dishes completes this very useful publication.

Fuel Economy and Smoke Prevention.

The London and Counties Coke Association has published a new illustrated Industrial Coke Brochure containing the results of independent evaporative tests which tend to prove that coke in ordinary boiler practice is more efficient than Welsh smokeless steam coal, of the highest quality, which is universally regarded as the most efficient coal produced in this country.

The brochure contains many striking figures, and also illustrations of the patent coke-burning Sandwich system of mechanical stoking in use at the new Deptford West Power Station of the London Power Company, where coke and the Sandwich system were first adopted in the year 1918. Since then the yearly coke and breeze consumption at electric power stations has averaged more than 100,000 tons; and, according to the recent report of the Electricity Commissioners, the consumption of coke breeze at power stations, during 1931, totalled 214,311 tons.

Sales to date thus aggregate more than 1,000,000 tons; and having regard to the fact that the users are our principal trade rivals, and are now probably the largest individual coke consumers, this result may be regarded as an achievement in salesmanship.

Probably few are aware of this important business relationship between the gas and electricity supply industries; and that the electric railway and other electric services in London are largely derived from fuel from which the valuable bye-products have been recovered.

In addition, partially-coke-fired power stations are probably among the most smokeless in operation.

River Pollution.

River pollution was discussed last week at the annual meeting of the National Association of Fishery Boards. Mr. F. H. Heald, Clerk to the Trent Board, introduced on behalf of that Board the subject of what was stated to be " the menace to the purity of many rivers which has arisen through the manufacture of sulphate of ammonia and similar products by synthetic processes, as a result of which many gas undertakings are now discharging their ammoniacal waste products directly into drains or streams, and the greater menace in the same direction which will arise through any development of the coal distillation industry, through Government action or otherwise, without the establishment of adequate safeguards against such pollution."

He said the Trent Board had drawn the attention of the Ministry to the matter with a request that steps should be taken to solve the problem. He had seen references to schemes that the Government might consider to improve the trade of the country, and the encouragement of the coal distillation industry was one. If there should be Government support of that important industry, anglers might find themselves in a worse position with this new form of pollution than they did with the development of the beet sugar industry.

Dr. H. T. Calvert (Rivers Pollution Research Board) said the question to which Mr. Heald had referred was a very pressing one. The Institution of Gas Engineers had a Research Committee which had been exploring the possibility of preventing pollution, and it was thought that the Institution was working on the right lines.

It was decided to communicate with the Ministry of Agriculture and Fisheries on the subject.

The report of the Joint Committee of Local Authorities and the Tyne Fishery Board, which has inquired into the pollution of the tidal portion of the river by untreated sewage and industrial effluents from gas-works, coke ovens, and tar distillation plants, suggests that, in the interests of public health, local authorities on both sides of the stream should confer with the Ministry of Health in framing a remedial scheme with national assistance.

Smokeless Fuel.

An interesting lecture on the domestic and industrial uses of gas coke as fuel was given by Mr. E. W. L. Nicol, of the London and Counties Coke Association, at the Municipal College, Portsmouth, on Feb. 21. The lecture was one of a series arranged by the Coal Utilization Council, and is an indication of the happy relations which exist between the Council and the Association.

Mr. Nicol, who is the Technical Adviser to the Association, described a few of the practical advantages of carbonizing coal before it is used as fuel, and explained that gas coke was the cheapest and only smokeless solid fuel generally available in this country, the production of so-called smokeless coal being limited to well-defined areas remote from the larger centres of population. Given a sufficient recognition of its advantages and ultimate utilization of the resultant gas, there was no practical limit to the possible production of coke.

With the growing demand for the abatement of the smoke evil, and recognition of the fact that the only solution to the smoke problem was the provision of smokeless fuels in adequate quantity and quality, the manufacture and grading of coke had been organized by the Portsmouth and District Gas Company and gas undertakings in many districts. The coke fuel and appliances specially designed for its use gave complete satisfaction to both industrial and domestic users.

One disadvantage of coke, compared with coal, was the difficulty of igniting it in the ordinary coal grates. The question of relative ignitability tended, however, to be of less importance as the facilities now available for the use of gas ignition devices became better known and more universally adopted.

Open coke firegrates were provided with a fixed ignition burner which, in a few minutes, kindled the fire positively every time without the aid of firewood. Similarly inset coke grates were available, applicable to any suitable existing firegrate.

BOOK REVIEW

A MANUAL OF GAS-WORKS CHEMISTRY.*

This book, the second edition of which now appears after a lapse of twelve years since its first publication, presents a description of the assaying and analytical methods in use at the La Villette Test Plant of the Paris Gas Company. Issued, as it is, under the ægis of so important a concern, it will prove of immense value to the gas-works of France and its colonies, while gas chemists in other countries will also be able to profit from the wealth of information contained in it.

The attitude at the test plant is a very conservative one; hence many of the methods described have been in use for a considerable period. This has the great advantage that results obtained over long intervals of time are strictly comparable, and renders it possible to follow the variations of the characteristics of coals without the complications which would be introduced if methods were constantly being changed. The methods chosen have, moreover, been those which combine the desired degree of accuracy with manipulative ease and rapidity.

The book opens with a description of the construction and method of operation of the test plant which is in continuous use on a regular routine and consists of two settings of seven horizontal retorts. Each retort takes a charge of one-seventh of a ton, the carbonizing period being 4 hours. An experimental retort taking a charge of one-thousandth of a ton is also installed for use when only small samples are available. Each plant has accessories for cooling and measuring the gas, removing tar and liquor, purifying the gas, and quenching the coke.

The first of the sections describing the analytical methods is devoted to coal and coke and covers proximate analysis, calculation of calorific value by Goutal's method, ultimate analysis, and determination of sulphur, nitrogen, and carbonates.

A section on gas follows and deals with therm yield, illuminating power, calorific value, specific gravity, analysis, determination of benzole, carbon dioxide, naphthalene, ammonia, sulphuretted hydrogen, cyanogen, and nitrogen.

The final sections are devoted to ammonia liquor, sulphate, tar, and purifying materials, which latter include native and artificial oxides as well as Laming material.

A few points may be noted. The amount of coal used in the volatile matter test is 2·5 grammes and a special form of crucible is employed. In place of Eschka mixture, a mixture of potassium nitrate, potassium carbonate, and sodium carbonate is employed in the determination of the sulphur content of coal. The specific gravity of gas is determined by a method involving a comparison of the weights of equal volumes (2·5 litres) of dry gas and dry air. Gas analysis is carried out in a Bunte burette, the total of the benzole, carbon dioxide, and unsaturated hydrocarbons being obtained by treatment with bromine and caustic potash. Benzole is determined separately by freezing out this constituent at −78° C. by means of a mixture of acetone and solid carbon dioxide, and carbon dioxide is estimated in a large volume of the gas by passage through potash followed by precipitation as barium carbonate. The unsaturated hydrocarbons are then calculated as a difference figure. Incidentally, the method originally used for benzole was freezing out at −21° C., a correction of 23·5 grammes per cub.m. being added to compensate for the benzole left in the gas at that temperature. A recent check test has confirmed the accuracy of this correction factor originally introduced fifty years ago.

Illustrations are numerous and include several folding plates.

A similar book embodying a description of the methods adopted in the laboratories of one of our leading gas companies would be of great service to the Industry, and it is to be hoped that the present volume may provide a stimulus for the preparation of an English counterpart. In several works, procedure is sufficiently standardized to render the compilation of such a book a by no means formidable task.

* Manuel de Chimie Gazière. Méthodes et Procédés des Essais et Analyses en Usage a l'Usine Expérimentale de la Villette de la Société de Gaz de Paris. By E. Sainte-Claire Deville. Second edition revised and enlarged with the collaboration of P. Sainte-Claire Deville. Paris 1933, Dunod. Pp. viii. + 238; 67 illustrations. Price, 43 francs bound, 38 francs unbound.

NOTES ON PLANT AND PROCESSES

Modern Gas Cooling Practice.

In the new series of technical brochures published by Messrs. W. C. Holmes & Co,. Ltd., of Huddersfield, No. 9 deals with modern gas condensing and cooling practice.

The publication devotes attention to the firm's "Super" horizontal tube condenser, which is claimed to offer greatly increased efficiency and economy in water consumption, due to the turbulence set up in the gas by the transversely arranged tubes and also to higher water velocities. For the same reasons, this type of condenser is most efficient in extraction of tar fog and naphthalene, and it is not liable to blockage.

Recent investigation on the important subject of the character of effluents has established the fact that it is desirable to condense the tar and liquor from the gas rapidly and separate them as quickly as possible. The "Super" condenser can be fitted with the Holmes patent tar separator and liquor cooler (dealt with on later pages of the brochure), which fulfils these requirements most effectively.

The installation of a cyclone tar extractor, details of which are also included, immediately before the condenser is also an advantage and ensures the precipitation of a large proportion of the tar above the dewpoint of the gas and results in an additional beneficial reduction in the toxic character of effluent liquors.

The section devoted to design and calculation of cooling surfaces is the work of Mr. C. Cooper, M.Sc., Chief of the firm's technical staff, and with the exception of that dealing with heat transmission coefficients (which originally appeared in Mr. Cooper's paper given before the World Power Conference in 1928) this has not previously been published.

Many of the installations of "Super" condensers referred to in the brochure have been tested under varying conditions by members of the firm's own staff collaborating with those of engineers of the works at which they were installed.

A number of excellent photographs of Messrs. Holmes' plant installed at various works gives some idea of the scope of the activities of this progressive firm., who are continually carrying out research and works investigations to improve the construction and efficiency of the plant in which they specialize.

Fenilic System of Heating.

The Whessoe Foundry and Engineering Company, Ltd., have taken over the management and all licence rights, from Universal Industrial Developments, Ltd., of the "Fenilic" system of heat transfer. This system is described in some recent literature of the Whessoe firm—literature which includes information on the "W.W-D" electric de-tarrer, the Whessoe gas preheater, and the Whessoe-Pfeiffer air separator.

In regard to the "Fenilic" system, a series of eutectic liquids has now been produced which, while possessing all the advantages of diphenyl and its oxide, have their setting points so far depressed that they remain liquid at all temperatures above the freezing point of water. These liquids, of which the one commonly employed is known as "Fenilic" B, have, it is stated, all the properties necessary for heat transfer purposes, the viscosities being approximately the same as that of water, the rate of heat transfer being abnormally high, and the boiling points of the order of 480° F. (250° C.). At 570° F. (300° C.) the pressure developed by "Fenilic" is 18 lbs. per sq. in., and even at 750° F. (400° C.) the pressure is only 142 lbs. per sq. in. above atmospheric pressure.

These liquids will stand heating for indefinite periods without decomposition at temperatures as high as 900° F. (480° C.). In addition, they have the substantial advantage of being good insulators electrically, so that submerged coils can be placed direct in the liquid without protection and a very high rate of heat transfer from the coil to the liquid can be employed without risk of decomposition or carbonization.

Owing to the comparatively high co-efficient of expansion of these materials and consequently the big change in specific gravity, thermo-syphon circulation is highly efficient, much more so than with water: while pump circulation can be, and is, generally employed where high rates of heat transfer are required and where the circuits are relatively long. The ultimate scope of "Fenilic" would appear to be very wide.

Comparative Working Results of the Three Metropolitan and Six of the Suburban Gas Companies

STATEMENT SHOWING THE WORKING RESULTS AND THE REVENUE ACCOUNT COSTS PER **THERM** SOLD FOR THE YEAR 1932

Compiled by Mr. F. J. Bradfield, General Manager and Secretary of the Commercial Gas Company

	Gas Light and Coke.	S. Metropolitan.	Commercial.	S. Suburban.	Wandsworth.	Tottenham.	Croydon.	Lea Bridge.	Hornsey.
Declared calorific value, B.Th.U.	500	560	500	560	500	500	500	500	500
Gas sold on declared calorific value, therms	252,640,417	91,465,747*e*	17,266,740	21,950,763	27,830,735	19,030,234	14,978,092	5,196,525	3,990,713
Increase, p.ct.	Dec. 2·54*a*	Dec. 3·75*f*	Dec. 4·15	Dec. 0·59	0·80	0·98	Dec. 1·37	0·71	Dec. 4·85
Gas made per ton coal on works tests, therms	74·87*b*	75·13	73·27	74·66	71·05	73·44	74·57	81·26	69·58
Gas unaccounted-for, p.ct.	4·23	0·15	4·12	7·12	3·64	6·00	7·01	3·96	2·00
Coke made for sale per ton coal, cwt.	10·00	9·33	10·94	9·65	9·60	10·57	10·03	10·25	10·92
Tar made per ton coal, galls.	10·48	10·46	10·08	9·92	10·26	11·31	12·65	15·96	12·38
Liquor made per ton coal, galls., 8 oz.	26·07	40·96	47·68	28·84	15·48	26·19	30·18	43·88	38·34
Percentage of coke used as fuel	19·98	21·68	18·94	19·85	25·40	21·86	20·17	21·83	16·00
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Capital expended (*less* nominal additions) per therm sold	1 11·36	1 6·48*g*	1 9·98	2 3·75	2 1·70	1 9·82	2 5·30	1 10·56	1 10·05
Capital employed per therm sold	3 3·56	2 1·97*g*	3 2·84	2 10·65	2 7·79	2 2·06	2 10·11	1 11·96	2 4·47
	d. d.	d. d.	d. d.	d. d.	d. d.	d. d.	d. d.	d. d.	d. d.
Price of gas per therm (L'day, Mid. .*	8⅝ 8⅝	8¾ 8¾	9 9	9½ 9½	7⅝ 7⅝	8⅛ 8⅜	9 9	8½ 8½	8 8
in principal area (Michs., Xmas	8⅝ 8⅝	8¾ 8¾	9 9	9½ 9½	7⅝ 7⅞	8⅜ 8½	9 9	8⅝ 8⅝	8 8
Costs per Therm Sold.									
REVENUE ACCOUNTS.	d.	d.	d.	d.	d.	d.	d.	d.	d.
Coals, oil, &c.	3·16	3·19	3·73	4·51	3·78	4·29	3·75	3·72	4·39
Less residuals—Coke and breeze	1·40	1·46	2·17	1·55	1·57	1·79	1·61	1·32	1·84
Tar	·39	·32	·48	·28	·41	·37	·42	·44	·35
Amm. liq. & sulph. amm.	Dr. ·00	Dr. ·02	·05	Dr. ·05	Dr. ·03	Dr. ·03	Dr. ·05	Dr. ·07	Dr. ·04
Total residuals	1·79	1·76	2·70	1·78	1·95	2·13	1·98	1·69	2·15
Net for coals, oil, &c.	1·37	1·43	1·03	2·73	1·83	2·16	1·77	2·03	2·24
MANUFACTURE—									
Salaries	·14	·24	·22	·18	·18	·18	·19	·08	·20
Wages—carbonizing	·35	·56	·50	·49	·38	·52	·30	·41	·47
Purification	·07	·16	·08	·08	·10	·07	·06	·06	·09
Repairs—plant	1·45	1·36	1·26	·96	1·62	1·66	1·40	1·57	1·21
Net manufacture	3·28	3·75	3·09	4·44	4·11	4·59	3·72	4·15	4·21
DISTRIBUTION—									
Wages and salaries	·64	·33	·35	·73	·37	·31	·51	·14	·30
Repairs—Mains and services, &c.	·84	·66	·61	·98	·58	1·50	·93	·68	·64
,, Meters & prep. meters & fittings	·43	·84	·98	·70	·70	·52	·35	·46	·38
,, Stoves—ordinary & prepayment	·82	·58	1·00	·59	·65	·49	·72	·77	·25
Total net manufacture & distribution	6·11	6·16	6·03	7·44	6·41	7·41	6·23	6·20	5·79
Rents, rates, and taxes	·61	·36	·49	·19	·26	·47	·50	·50	·33
MANAGEMENT—									
Directors, Auditors, and salaries (Secretary, &c.)	·11	·15	·20	·20	·20	·16	·21	·30	·35
Collectors	·19	·16	·32	·12	·11	·20	·24	·13	·08
Stationery and general charges	·15	·21	·21	·18	·22	·19	·25	·25	·21
Co-partnership	·10	·18	·19	·17	·23	·17	·20	·14	·14
Bad debts	·02	·01	·01	·02	·03	·00	·01	·01	·04
Law and parliamentary charges	·01	·01	·01	·04	·01	·00	·00	·01	·00
Superannuation, pension funds, &c.	·20	·17	·27	·17	·21	·18	·25	·12	·26
National Insurance	·07	·23*h*	·08	·07	·08	·09	·05	·06	·06
Sundries	·01	·01	·00	..	·01	..	·00	..	..
Total expenditure (*less* residuals)	7·58*c*	7·65*i*	7·81	8·60	7·77*l*	8·87	7·94	7·72*n*	7·26
GAS (*less* public lighting expenses)	8·11	8·01	8·33	9·08	7·91	8·60	8·96	8·17	7·91
Rentals—Meter & prep. meter & fittings	·85	·69	·72	·64	1·08	·50	·54	·46	·37
Stove	·61	·45	·61	·69	·58	1·42	·62	1·01	·69
Incand. mantle maintenance	..	..	·01	..	..	..	..	..	..
Miscellaneous	·05	·02	·02	·01	·03	·34*m*	·25	·00	·03
Total—Gas, rentals, &c.	9·62	9·17	9·69	10·42	9·60	10·86	10·37	9·64	9·00
Balance, being profit	2·04	1·52	1·88	1·82	1·83	1·99	2·43	1·92	1·74
Dividend and interest	1·90	1·48	1·93	1·75	1·78	1·59	2·16	1·42	1·39
Surplus or deficit	·14	·04	Def. ·05	·07	·05	·40	·27	·50	·35
Contributions to funds and sundry payments	·13*d*	·04	·00	·05	·09	·01	·26	·30	·30
SUNDRIES.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Coals cost per ton	20 8·54	19 7·43	21 2·31	23 9·00	22 6·43	26 4·72	25 0·08	27 11·53	27 2·00
Coke realized per ton coal	9 9·02	8 8·90	12 0·35	10 8·95	9 1·57	11 4·14	11 8·50	..	13 7·42
Coke ,, ,, ,, coke	19 6·04	19 5·02	21 11·81	22 9·82	21 5·45	21 5·70	23 4·13	23 9·65	24 11·31
Breeze ,, per ton	4 7·75	2 5·97	3 3·41	0 9·68	6 3·41	6 8·43	5 8·81	..	..
Tar ,, per gallon	0 3·27	0 2·27	0 3·21	0 2·41	0 2·91	0 2·53	0 2·73	0 2·74	0 2·33
Amm. liquor, &c., realized per butt, 8 oz.	Dr. 1·55	Dr. 1·14	0 10·45	Dr. 1 3·44	Dr 1 5·09	Dr. 11·69	Dr. 1 3·28	Dr. 1 8·40	Dr. 10·17
Percentage of stoves at rental to consumers	97	112	102	99	74	81	77	72	40
Bad debts p.ct. on total receipts	·17	·11	·08	·15	·22	·04	·11	·11	·13
Net profit p.ct. on ordinary capital	6·36	6·24*f*	5·94*k*	6·39*d*	7·49*j*	9·72*m*	10·64	11·81	8·58
One-fifth penny variation equals gross	£198,478*a*	£92,067*f*	£17,517*f*	£22,334*j*	£22,250*a*	£15,859	£12,482	£4330	£3326
Water gas p.ct. on total make of c.ft.	21·32	..	..	..	15·17	19·92	30·71	30·07	30·97

a—On gas charged to consumers.
b—Before benzole extraction.
c—Excluding expenses *re* amalgamations, &c.
d—*Less* grant from Treasury.
e—Including sales to South Suburban.
f—Excluding sales to South Suburban.
g—Eliminating purchases of South Suburban and Commercial stocks.
h—Including co-partnership insurance fund.
i—Excluding expenses *re* issue of capital.
j—One farthing variation on gas charged.
k—Excluding stamp duty.
l—Excluding capital duty.
m—Including electricity results.
n—Excluding reserve for superannuations.

Gas for Commercial and - - Industrial Purposes - -

Report of a conference of over 400 representatives of the National Gas Council, the Institution of Gas Engineers, and the British Commercial Gas Association, who met at the Hotel Metropole, London, on Feb. 7, to consider the inauguration of a National Campaign for extending the Use of Gas for Commercial and Industrial Purposes.

OUTLINE OF A NEW POLICY.

The chair was taken by Sir David Milne-Watson, LL.D., D.L., President of the National Gas Council; and he was supported by Mr. R. E. Gibson, M.Inst.C.E., President of the Institution of Gas Engineers, and Mr. Wm. Cash, F.C.A., J.P., President of the British Commercial Gas Association.

The Story of the Movement.

Sir David Milne-Watson stated:

This National Conference has been called to discuss questions of vital moment to the Gas Industry, and it is a matter of great gratification to the three National Bodies in whose names the invitation was issued, that there has been such an admirable response. It indicates a widespread realization of the importance of the subject which we are about to discuss, of the need for dealing with it on a national basis, and it indicates also, as I hope and believe, a determination to co-operate in the completion and execution of a scheme which will further the interests of the Gas Industry as a whole, and of each of the individual units of which it is composed.

As the letter inviting your attendance points out, the National Associations hold the view that on the one hand the competition which we now have to face, and on the other the opportunities which are now offered, call for the inauguration of a national campaign for the purpose of extending the use of gas for all purposes for which it can be economically employed, and in particular for commercial and industrial purposes.

As you know, a great deal has already been done in this direction, and it is because the results achieved in certain districts have been so successful that national effort is now called for. Let me briefly sketch the history of the movement.

In July, 1930, a Joint Committee, consisting of representatives of the three national bodies, was set up to deal with the development of large-scale gas supply for commercial and industrial purposes, and, having agreed that the time was ripe for a comprehensive survey of new fields of supply with a view to securing new business, decided to seek to secure the setting up in each district of Industrial Centres, as they were then called, but which I think would be better termed "Gas Development Centres"—and also the formation of a National Liaison Committee, consisting of representatives of such centres, to collect and disseminate to all those supporting the scheme the information available. Details of the scheme were communicated to the districts.

The scheme contemplated, *inter alia*:

(1) The preparation in each Development Centre of a census of the industrial and commercial uses, existing and potential, for which (considering every factor, including cost) gas could and should be utilized.

(2) The training and engaging of fuel experts, and the consideration of how best to make such experts *available to the Industry at large.*

(3) The type and character of research work required in respect of plant and furnaces.

(4) The acquisition and equipment of premises suitably situated in each district for displaying and demonstrating different types of research work required in naces.

(5) Consideration of the trend which publicity and propaganda should take.

In three provincial districts the scheme was immediately taken up, and in each case the district was fortunate in finding a large undertaking with great experience of industrial practice, prepared not only to take the initiative, but admirably equipped both in men and material to do so.

The results, I am glad to say, have been most satisfactory, and the districts in particular, and the Industry as a whole, have been placed under a very great obligation to the Birmingham, Newcastle, and Cardiff Undertakings for their public-spirited action, and for the magnificent services which have been rendered to the Industry.

In London, owing to exceptional circumstances which will, I hope, be overcome, a district organization as a district has not yet been brought about, but I am glad to say that the Gas Light and Coke Company, and certain other companies, being also equipped with special facilities, have been able to play a not inconsiderable part in furthering the same object.

Elsewhere, unfortunately, results have, up to the present, been disappointing, for, though in many cases a strong interest is still being taken in the scheme, in fact the Development Centres have not yet been created.

Now it is of the essence of the scheme that each district should have a self-supporting and self-appointed Centre of its own, in the operation of which all who support it co-operate, supplying to it, and receiving from it, all relevant information in regard to gas development—and particularly development for industrial and commercial uses. Each such centre must have its demonstration rooms, its technical experts, and its facilities for research; the provision of which, of course, demands financial support. It must, also have the means of communicating to, and receiving from, other centres such information as is available.

Co-Ordinating Body Needed.

The failure to set up a Development Centre in each district has, therefore, been fraught with serious consequences. It has made it impossible to create the National Liaison Committee, which is clearly another essential part of the scheme, and the absence of a co-ordinating body has thrown upon those centres which have been set up a burden which they are not unnaturally unable physically or financially to bear. They have been "snowed under" by requests for information and advice from individuals all over the country, and while they have shown themselves most anxious to comply, they are finding it impossible to do so. Moreover, they have been requested—and have been glad, as far as practicable, to comply with such requests—to send their experts to help other undertakers, even though the latter were situated hundreds of miles distant and in some other district altogether. While my Company—and I am sure the other undertakers concerned—were glad, and still are glad, to do all that was reasonably in their power to help the Industry, matters have come to such a pitch that I personally found it impossible to offer the services of my officers to all and sundry. The business of the Company was actually suffering, and you will all agree that our business is primarily to look after our own undertaking and to see that it is well run.

Nor do these requests come only from individuals, for the national bodies, to whom they are also addressed in large numbers, in the belief that the information is to be had for the asking, must also have recourse to the few and already over-wrought centres which alone can suppiy it. To their great credit be it said that wherever possible they have enabled a reply to be sent to the inquirer, but again the limit has been reached, and a one-sided arrangement, which is totally inconsistent with the idea of district

co-operation permeating the Joint Committee's scheme, cannot continue.

I know that from time to time the objection has been raised—and as far as I know this is the only objection to the scheme—that additional subscriptions would be required from undertakers in the form of contributions to the Development Centres. A moment's consideration will, however, show, I think, that the suggestion that the mere fact that an undertaker subscribes to the three National Bodies, should, *ipso facto*, entitle him to each and every piece of information, and any and every kind of assistance, without further charge, cannot be sustained. The National Bodies have their work to do, and none of them are organized so as to be able to answer the hundred and one questions poured in upon them by these undertakings.

In the first place the information required is so varied, novel, and indeed, in many cases, so local in its application that it is impossible—at any rate, at the present time—for any one of the National Bodies to give accurate and exact information on the particular questions on which the Development Centres will be engaged.

Secondly, the National Bodies are themselves so constituted and equipped that it is only after they themselves have acquired from a few of the larger undertakers the information required, that they can transmit it to inquirers. This must, of necessity, lead to much overlapping and unnecessary work. Again, it sometimes results in information being disseminated which, while considered most up-to-date by, say, the Birmingham area, would not be held in the same esteem, perhaps, by the Development Centres in other parts of the country, and *vice versa*. In other words there is to-day a complete lack of co-ordination and an absence of co-operative machinery which is, in my judgment, handicapping the spread of knowledge which is of vital importance to every undertaker, however large or however small he may be.

We are also satisfied from actual experience that a vast proportion of the many new problems to be solved can only be solved on the actual premises of the consumer. It is essential, therefore, that the work should be decentralized and controlled by Development Centres in different geographical areas. The work done by each of these Development Centres will be collated, tabulated, and pooled by means of a National Co-Ordinating or Liaison Committee which, in turn, as and when circumstances warrant, will pass on such information to a Central Information Bureau for transmission again to individual undertakers.

I am confident that no one will venture to suggest that each and every inquirer and manufacturer can, as and when he likes, call upon the few large undertakers which have become, or are about to become, at very considerable expense to themselves, Development Centres, for information of every kind which he may require. Such a suggestion would be neither fair nor practicable, nor, indeed, as previously pointed out, satisfactory. It is obviously necessary that this information should only be made available to those undertakers who subscribe to their District Development Centre. The quantum of subscriptions is a matter for each individual district to decide; they will not be heavy, and I am satisfied that if they spend their money in this way it will return to them a hundredfold.

Central Information Bureau.

A word now in regard to the suggested Central Information Bureau. Its constitution and personnel, and the steps whereby the closest and most precise co-operation is maintained with the British Commercial Gas Association, the Institution of Gas Engineers, and the National Gas Council, will be the subject of most careful consideration by a Joint Committee, and I do not anticipate any difficulties, whatever they may be, arising which cannot be overcome in this regard.

So much for the actual organization, but I do not wish you to leave this conference with the idea that the machinery, when set up, will only deal with purely technical advice and technical assistance. Salesmanship, publicity, and research, of course, cannot be ignored. As has already been suggested, we believe that the machinery will be of great assistance to the British Commercial Gas Association, for example, in considering the trend which publicity and propaganda should take. For instance, the Joint Co-Ordinating Committee might recommend for the consideration of the British Commercial Gas Association that for a specified period (say, a month, or two months, or three months) publicity should be directed, say, to the "boosting" of water heating by gas. Again, there is no doubt that it will be necessary on numerous occasions to call for the assistance of the Institution of Gas Engineers in undertaking research into particular problems.

Lastly, new problems arising in regard to charges and policy will have to be considered by the appropriate body.

I am sure that, while this new scheme will not be relieving the national bodies of any work or responsibility, it will be of the greatest practical service to every undertaker in the country.

That is the outline of the scheme, and what we want from you to-day is your support to it in general. There may be—in fact there are sure to be—many criticisms of detail, but I would suggest that you concentrate on a constructive policy this afternoon. To-day we are up against a greater and fiercer competition than ever before. I am not talking of electricity alone; the competition there is very fierce indeed, but probably the competition is fiercest of all from oil, which is "knocking at the door" all the time and is cutting not so much, of course, into the gas business as into the coke business, which is of equal importance to the Gas Industry. We must not lose sight of the fact that if we lose the coke account we are going to find ourselves in difficulties very soon with our gas account.

There is one more point I wish to make. I hope you will not take up time this afternoon in discussing the personnel to give effect to the new policy. If we are agreed to-day on the general principle, the personnel can safely be left to the Co-Ordinating Committee, which I hope will be appointed as a result of this meeting. I shall move a Resolution at the end of the meeting that we set up a Committee to deal with the matter and to go into details—the Committee to consist of representatives from the three National Bodies. I do not, therefore, propose to take up your time this afternoon in discussing the kind of man, or men, required. We can, if necessary, advertise. The only object is to get the man best qualified for the job. In case there might be some misapprehension in this matter, I might say that nobody here has any particular nominee "in his pocket." As there are more speakers to follow, I will not take up any more of your time, but will appeal to you to give the matter your earnest thought and sink any petty jealousies and come forward for the good of the Industry. The future presents great difficulties, and it is absolutely essential that we should all unite and combine forces to put this matter of industrial and commercial gas on a sound and safe basis.

Support of the B.C.G.A.

Mr. William Cash (President of the British Commercial Gas Association): In rising in my capacity as President of the British Commercial Gas Association, to support the proposals of the Joint Committee of the three National Bodies which have been so clearly explained to you by the President of the National Gas Council, it is scarcely necessary for me to state that I should not be doing so were I not convinced that, in the interests both of the Gas Industry as a whole and of the British Commercial Gas Association, a scheme on the lines suggested should be brought into operation without any avoidable delay.

I am sure that everyone in this room will be sorry that Sir Francis Goodenough is not here, for reasons well known to you. He has been so identified with the B.C.G.A. that it would only have been natural for him to have addressed you, although I happen to be President this year. But I have a letter from him which I am sure you would like to hear.

> "I am very sorry that the effects of my operation prevent my being present at the meeting to support Sir David, yourself, and the other leaders in the Industry in making a strong appeal for further action towards co-operative development for the use of gas for industrial and large commercial purposes, as I should have very much liked to urge, with all the emphasis at my command, the importance of action being taken on the lines of the policy Sir David is recommending.
>
> It is abundantly clear to me from much evidence that I have received, and from considerable experience at Horseferry Road, that there is a very large field at present occupied by raw coal as a fuel, which is certain to be replaced in the comparatively near future by some other form of heat energy that will eliminate the labour and other drawbacks entailed in the use of raw coal, and will ensure increased output and improved quality of production in the factories making the change.
>
> In other words, the adoption of more nearly scientific methods for the present unscientific and haphazard ways of using our great national asset is certain before long.
>
> The field now occupied by raw coal will then be occupied by electricity, gas, or oil. The extent to which it is occupied by one or other of those three heating sources will depend very considerably upon the way in which the problem is tackled by the Gas Industry *now and in the immediate future.*
>
> I am very confident that, if the field is attacked by the right men in the right way—that is, by those having both the necessary technical qualifications and the commercial gifts required to present the case for gas to the responsible heads of business—a far greater harvest can be reaped for the Gas Industry than many people at present conceive.
>
> In this matter co-operation is essential. The Industry

cannot afford any petty-mindedness; it cannot afford parsimony; and it certainly cannot afford delay.

I believe that in a few years' time we shall look back to this meeting as the inauguration of a very important new era for the Gas Industry."

I do think that this letter is of great value, because you know his enthusiasm and the interest he takes in these matters, and if he thinks it is the right thing to move forward along this line, it must be right.

Sir David Milne-Watson has dealt so fully with the consequences which have followed the failure to carry out in its entirety the scheme originally devised, and with the steps which it is now proposed to take to overcome the difficulties which have arisen, that I do not propose to dwell at length upon the more general aspect of the matter. I desire, however, to call your attention for a few minutes to the repercussions of that failure upon the British Commercial Gas Association, and to try to dispel certain misconceptions which have arisen in regard to the functions of that body in relation to the scheme.

It has been assumed by many of our members that because the British Commercial Gas Association is responsible, *inter alia*, for advertising new uses for gas—and it has always been our policy to give the fullest possible publicity to such uses at the earliest possible moment—we were in a position to give to them individually detailed technical information in regard to every new adaptation of gas whatever its use.

In so far as we were able to do so, we, of course, complied with those requests, but it must be remembered that the information desired was often only obtainable through the courtesy and generosity of those few undertakings which, having obtained the services of technical experts, and having otherwise organized and equipped themselves at considerable expense for the conduct of research, were in a position to supply it.

And here I would like to echo the tribute paid to the existing centres by Sir David Milne-Watson for the extremely public-spirited and ungrudging way in which they have sought to cope with the constant stream of inquiries addressed to them, not only by the British Commercial Gas Association and the other national bodies, but also by a large number of individual undertakings. Obviously, however, such a one-sided arrangement cannot continue even if it were satisfactory, which it cannot be under the present system, and even if it were physically possible to maintain it; and even when further centres are formed the British Commercial Gas Association could not take the place of the co-ordinating body which is an integral part of the new scheme, as it was intended to be of the old.

The scheme is essentially dependent on the establishment of a centre in each district and upon the closest co-operation between those centres in the mutual exchanging of information through the medium of a co-ordinating body.

Equally fundamental is the employment of technical experts by whom alone the information or advice in regard to little known or potential uses of gas for commerce and industry can be furnished. Large undertakings are in a position to retain such experts as part of their permanent staff, but the vast majority of the smaller undertakings, to whom the development of the use of gas for many purposes is of great importance, cannot possibly afford to do so. For them the solution of the difficulty lies in the co-operative effort proposed by the scheme.

If advice or information of the kind indicated is desired, and those seeking it are not in a position to employ heat experts on their own account, then they must obtain it by contributing to the support of their district centre, thus securing access to the accumulated information which it possesses, and the services of the experts which it retains. Further, it must be borne in mind that a great deal of detailed inquiry and research must be conducted in the workshops of those considering the use of gas for industrial purposes. Such visits necessarily involve expense, for travelling and so on, sometimes considerable, which can no longer be allowed to fall, as it has fallen in the past, upon those public-spirited undertakings which, up to the present, have been operating the scheme in its present form.

There is no question of the British Commercial Gas Association relinquishing any of its functions. It is merely seeking to avoid being pushed further into a false position. It will continue to do for this very important branch of the Gas Industry's activities what it seeks to do in regard to all other branches, and there can be no doubt that the value of its work in this respect will be enhanced and by no means lessened by the existence of the Central Information Bureau which it is proposed to set up.

A Field Worth Every Effort.

I desire to emphasize that there is a most desirable field—but that this field is not ours for the asking. We cannot walk in and occupy it; still less can we expect to be carried into it on the backs of our more enterprising colleagues. It is already occupied, and those responsible for the supply of other fuels are keenly alive to the importance not only of ousting those already in possession, but of keeping out those seeking to enter. A struggle is inevitable, and if it is to be successfully waged, everyone in the Gas Industry must play his part. There must be complete co-operation and a mass attack. The pioneers have already shown us the way, and here and there are now strongly entrenched in portions of the new territory, to the very great benefit of themselves and their own immediate customers. They found quite early that a conviction on their part, however profound, that gas is the ideal fuel for industry was not sufficient. They realized that it was necessary to get the potential consumer to share that conviction; to show him that his heat requirements could be more efficiently and more economically met by gas than by any other fuel; to study his needs in his factory or workshop, to deal with individual cases as and when they arise, and thereafter to devise gas-fired appliances which were preferable to those he formerly used.

What they have done, we, through this new organization, can do, but it means hard work and loyal co-operation. There must be an end to apathy and to petty jealousies. We must all work together.

Further, we should act without delay, for the time is propitious, and this matter is pressing. Signs are not wanting that industry is beginning to recover slowly from the effects of the depression which has borne upon it so heavily and so long. With returning confidence men are receptive of new ideas. They realize too, more than ever before, that production costs in which so often fuel cost is a vital factor, must be reduced to the lowest level consistent with efficiency.

The opportunity is offered. Are we prepared to seize it whole-heartedly? It is to answer that question that your Joint Committee have called you together to-day. They have anxiously considered the whole position, and the proposals which have been put before you have been drawn up by them in the belief that if carried out they will enable us to attain the objects in view, and so help us to maintain our position as one of the country's greatest industries.

In conclusion, I agree with Sir David that questions of detail must be left to a Committee which can start with a free hand and devise the best methods which can be found for carrying out this particular project and bringing it together under a system of co-ordination.

Co-Operation Essential.

Mr. R. E. Gibson (President of the Institution of Gas Engineers): Speaking as the President of the Institution of Gas Engineers, I am glad to be here to give support to the scheme which has been outlined to you by Sir David Milne-Watson and Mr. Cash. The Institution has, of course, a particular interest in the scheme, as the development of the uses of gas on the industrial side is largely, but not entirely, a technical matter. Co-operation and the pooling of ideas has always been part of the code and tradition of gas engineers, and the Institution has, through the medium of its Special Committees and its Joint Research Committee, in conjunction with the University of Leeds, endeavoured to assist its members in investigating numerous subjects and publishing the results of such investigations for the benefit of the Industry at large.

This work, I think I may say, has been well accomplished and has been recognized and appreciated by the Industry.

Side by side, however, with such investigation and research, a large amount of work has been undertaken by the larger individual undertakings possessing the necessary personnel and equipment, especially with regard to the application of gas to industrial purposes, and the results have been freely contributed by such undertakers when requested so to do.

In the past such requests were not numerous, and no great strain was thrown upon the larger undertakings I have mentioned. Recently, however, owing to the increasing pressure of the competition with which all undertakings are faced, and to the need for securing new outlets for the sale of gas, the investigating work of individual undertaking has been intensified and the calls made upon their time and services by other undertakings have been immensely increased. To all these undertakings we are much indebted for the services they have rendered.

As Mr. Cash has pointed out, the smaller undertakings are not themselves in a position to obtain the necessary personnel adequately to cope with the many problems which stand in the way of obtaining fresh outlets for gas, and particularly gas for large-scale heating and industrial uses. Furthermore, these particular problems can often only be solved *in situ;* in other words, an individual premise or factory may have to be regarded in itself as the research laboratory where the solution of their problem is to be found. It was a direct result of the spread of such

local investigation, coupled with an ever-growing appreciation of the immense importance of the new field to be occupied, that the co-operative machinery referred to was advocated by your Joint Committee over two years ago.

Work in America.

By a coincidence I have just received from America particulars of a campaign inaugurated by the American Gas Association to further the use of industrial gas, together with an interesting technical document on the application of gas to forging. It is interesting to think our American colleagues are taking further steps to develop the industrial load, especially in view of the large proportion of their output already taken for industrial purposes, among which the increased consumption for central heating and refrigeration is almost spectacular. The forthcoming visit to Canada and America arranged by the Institution to take place next autumn will give many opportunities for participants to study at first hand the industrial gas problems in those countries, and there is no doubt that much useful information will be gathered.

There is no need to remind those present that the situation to-day is very different from that of five or even two years ago. Our competitors are becoming increasingly active. The Chairman of the Central Electricity Board is reported to have said recently that the Board over which he presided hoped to establish themselves during the coming year as a trading concern with country-wide ramifications; that the great bulk of the electricity supply undertakings would find it unnecessary to spend their capital upon generating plant, but would be able to devote the whole of their resources to the extensive development of distributive systems, and the wholesale conversion to electrification in this country was, in his view, inevitable. There is very little doubt that our electrical friends are about to make a renewed attempt to try to take our business from us. We can expect during the next few years intensive competition such as we have not experienced ever before.

It is well known to all of us that for certain purposes, oil is also a very strong competitor. This is particularly so in the central heating and industrial field.

How can this competition be met? In the first place we must face the facts. It is no good hiding our heads in the sand. Having faced up to the situation there is much we can do to meet the competition. One of the main things that ought to be done is to take such steps as are necessary to ensure that all the scientific and technical knowledge available should be brought to bear on the utilization of gas for industrial and commercial purposes. I should like to dwell on the technical aspect of the matter for a few minutes. The question of efficiency in use is of tremendous importance, because apart from any other considerations it has a direct bearing on the ultimate cost of any heating process, and it is the ultimate cost that is, in perhaps nine cases out of ten, the deciding factor when a prospective customer is considering what method of heating he will adopt.

It is absolutely essential that gas should be applied to each particular purpose in the most efficient manner possible, and with the elimination of all unnecessary heat losses. Much can be done to strengthen the position of gas by giving close attention to these matters. It is here that the scientifically trained technical man can be of great service.

Technical investigation into particular heating problems is necessary if gas is to hold its own. Each individual industrial consumer must be shown how he can get the greatest possible efficiency and economy by the use of gas. Improved efficiency and reduction in cost have been brought about in thousands of cases. Such service is invaluable in retaining business and promoting new business. Let me give you a few striking examples of such cases, which include both large and small scale users.

Aero Engineers.

An industrial representative called on a large firm of aero engineers and found they were involved in problems concerning the heat treatment of duralumin used in the manufacture of aeroplanes. Three salt baths were in use, heated in a very uneconomical and inefficient manner by bunsen burners placed beneath the tanks, no attempt at insulation having been made. The firm were seriously considering the use of oil. Estimates were submitted for properly designed gas-heated tanks, and two new baths were installed, one 10 ft. long and another 3 ft. long, the larger one consuming 1000 c.ft. per hour and taking 2½ hours to heat up, and the smaller one consuming 300 c.ft. per hour and taking 1¾ hours. The temperature required was 550° C. The firm expressed great satisfaction and are now considering the construction of a drying oven large enough to accommodate the whole fuselage of an aeroplane, together with two smaller ovens. The present consumption is 8 million c.ft. per annum, with the prospect of a much larger consumption if the ovens are erected.

Silversmiths.

A large firm of silversmiths were using anthracite gas producer plant to supply a large annealing furnace. After many discussions with these people an industrial representative was able to convince them of the reliability and advantages of town gas, and they ultimately decided to change over. No structural alterations were necessary and the change-over was effected at extremely low cost. The conversion was the means of adding approximately 15 million c.ft. of gas per annum to the industrial load and with complete satisfaction to the customer.

Lemon-Cheese Cooking.

A baker, very dissatisfied with the time taken to cook a given weight of lemon-cheese, was contemplating the substitution of steam in place of gas. On investigation by the technical expert, an improvement was brought about by the employment of a high-temperature boiling solution in the jacket of the pan used. The baker is highly pleased with the result, as the time taken has been reduced from 4 hours to 1¼ hours with a corresponding reduction in gas consumption. He is about to consider the installation of an additional pan on the same principle. This baker has also been induced to use gas for large baking ovens in a new factory.

Gelatine Solution.

A baker was dissatisfied with the time taken in bringing to boiling point a solution of gelatine, capacity 10 gallons. Seven hours were occupied by the heating process. After a technical investigation and experimental work it was found possible to reduce the times from seven hours to two hours with a reduced consumption of gas, the saving being 50 c.ft. for each operation. The attention given to this case resulted in an order to overhaul all the baker's ovens, and led him to carry out further improvements. He is now ready to consult the undertaking when any extensions are necessary.

Cooked Meat.

Complaints were received from a firm of cooked meat specialists with regard to the cooking apparatus in use. Considerable time was spent by a technical representative on the plant, and the heat distribution was altered in a large oven used for cooking pork. A great improvement was made, and the firm now state that gas is better for their purpose than either steam or electricity. So satisfied are they that they have recently placed an order for two further ovens of a similar type and have sent an inquiry for six more ovens.

Biscuit Baking.

In 1915 a biscuit factory using producer gas for its baking ovens was approached with regard to the use of town gas. Its advantages were put forward and methods were suggested whereby improved efficiency could be obtained with town gas. The result was that the producer gas plant was scrapped and town gas installed. Since then the number of baking ovens in that factory has been increased enormously, and the annual consumption of gas has gone up from 378,000 c.ft. in 1915 to 79,231,000 c.ft. last year—*i.e.*, over 200 times the quantity at first used. A very striking instance of good service leading to a large increase in business.

So many and varied are the applications of gas for industrial and commercial purposes that it is well-nigh impossible for any man or any one industrial department to have had experience of them all. The scheme we are considering to-day provides for the collation of all information now available at headquarters and in the districts, and for adding to it from time to time as knowledge extends. This co-operative and co-ordinating machinery is clearly essential, because it is only by this means that the Industry will be able to place itself in the strongest possible position to meet all competition equipped as it then will be with the latest information as to efficiencies and methods of use for any particular trade or process.

Speaking as the President of the Institution, I would urge every member to commend the scheme whole-heartedly to his Board of Directors or Committee, and to do all that is in his power to see that his undertaking contributes towards the establishment of a suitable local centre, and to give such centre his most loyal support and co-operation. I am satisfied that by so doing the undertakings will be serving themselves, their consumers, and the Industry at large.

Birmingham's Experience.

Mr. A. W. Smith (General Manager and Secretary, City of Birmingham Gas Department) expressed his pleasure at the large attendance at the meeting.

He ventured to say that the suggestion being considered

that afternoon really arose out of Birmingham's experience. For some years past Birmingham had been called upon periodically to assist various undertakings in their industrial development, and one of these—Smethwick—had approached them saying that they did not like coming to ask for assistance, so to speak, "cap in hand," and suggested that Birmingham should work out a scheme on a proper basis whereby the undertaking would contribute to the costs incurred by Birmingham.

As St. Paul had it, "I am a citizen of no mean city," and Mr. Smith added that he was proud of the fact that he was a servant of no mean—in another sense of the word—Gas Committee. The Committee might have taken the attitude that the problem was not a Birmingham one, but he was glad to say they had not done so. They had taken the view—quite rightly—that inefficient service in one undertaking was bound to reflect upon other undertakings, and that having in twenty-two years built up a trained staff to deal with industrial gas service, they ought to be prepared to place that service at the disposal of the Industry, but not, of course, at any loss to the Birmingham Gas Department. Later, the suggestion was made of a National Laboratory, with Birmingham as a nucleus. Here again his Committee had naturally felt that they could not spare the various officials to be peripatetic investigators of problems up and down the country.

Arising out of that, they had come to the conclusion, after a very well attended meeting of the Committee of the three bodies, that the best way would be to create local centres: that these centres should be supported—as was Birmingham—by a number of undertakings round about; and that there should be a Co-Ordinating Committee of these centres.

Sir David Milne-Watson had called a meeting of the chairmen of important gas undertakings and secured their sympathy to the scheme, and that scheme was, in essential details, the one put forward to-day. It had not gone ahead quite as quickly as had been hoped. Mr. Madden had been very active in Cardiff, Mr. Ridley had done remarkably good work in Newcastle, but apart from Newcastle, Cardiff, and Birmingham, there seemed to be a halt in the establishment of centres. It appeared that the propaganda of the B.C.G.A. concerning the industrial uses of gas, had outstripped the organization of the centres, and the B.C.G.A. were embarrassed by almost daily inquiries, not only from gas undertakings, but from manufacturers who had seen the advertisements and were asking for information on technical points, which information could frequently only be given after investigation on the spot.

This was really the reason for the present meeting, to see if the machinery could not be speeded up to keep pace with the publicity given by the B.C.G.A. Mr. Gibson had given them one or two examples of industrial gas sales. These could be multiplied 20 and 100 times. Mr. Halkett, who was present, had put through some remarkable industrial gas sales in his own area. In Birmingham they had in the case of one particular firm recently increased a consumption of less than 20 million c.ft. a year to 180 million c.ft. a year. This was done by investigation on the spot and the displacement of producer gas plant and the utilization of town gas.

In addition to helping many local undertakings, his Committee had agreed, up to a limit, to help several undertakings in Lancashire and Yorkshire, who paid them a retaining fee and called upon them at any time. But the position had now been reached when the Birmingham staff could do no more, and yet a tremendous number of applications were coming in, both direct and through the British Commercial Gas Association. He did, therefore, hope that the Resolution to be proposed would be passed unanimously. There was no need to go into details at this meeting, but there was urgent need to set up the centres suggested.

Newcastle's Industrial Section.

Mr. T. P. Ridley (Commercial Manager and Secretary, Newcastle-upon-Tyne and Gateshead Gas Company) regretted the unavoidable absence of his Chairman, Mr. John E. Cowen, because he would most earnestly have supported any proposal for developing the sale of gas for industrial and commercial purposes.

In Newcastle they had not the wide experience of that class of business that Birmingham and Sheffield had, but they had had the recent experience of starting an Industrial Section, and as a result of the meeting to which Sir David referred as having taken place some two years previously, they had had the additional experience of operating one of the Development Centres mentioned.

As they were all aware, Tyneside was one of the most depressed areas in the country, and had been so for some years, but there had been no decrease in the sales of gas until 1932, and that decrease was less than 1%. In view of the results in certain other places where the depression had not been so acute, he considered this position very satisfactory, and one which could not have been achieved if they had not started their industrial department.

Newcastle had set up its Industrial Section some five years ago. Prior to this, he (Mr. Ridley) had been told that the trades in the area were such as were not suitable for the employment of gas. They were considered too heavy. He was next told that even if they were suitable, trade was so bad that it was largely a waste of energy to endeavour to develop the use of gas. But trade got worse instead of better, and so his Company eventually disregarded these suggestions, and took the plunge into the industrial business. They were now thoroughly satisfied that they had done so.

The Directors sanctioned the starting of an Industrial Section and authorized the expenditure upon it of £2000 a year. For the first two years they did not obtain as much business as they had hoped, for the reason that their charges were too high—*viz.*, 6·7d. down to 6·4d. per therm for very large quantities in competition with very cheap coal and very cheap industrial electricity. In 1929, however, having obtained a new Act of Parliament, they were enabled to introduce a two-part tariff, which had proved most satisfactory.

Mr. Ridley quoted figures to show how the two-part tariff had not only checked a decline in the use of gas by a large firm, but had greatly developed the use of gas.

He stated that to-day this firm used gas solely for all its heat treatment work.

To-day the Newcastle Gas Company had a 'bus running on gas, which, if it continued satisfactory, would go into passenger service. Without their Industrial Section this would not have been possible.

Newcastle had had nearly two years' experience as an Industrial Development Centre. They had started with nine subscribing undertakings representing, including Newcastle, sales of 840 million c.ft. per annum. At the end of the first year the costs were ascertained and every undertaking renewed its subscription, and they had had a new member since. The cost was £2350, of which the subscribing members paid 16%. Their sales represented 40% of the total. The Newcastle Company sent out to each subscribing undertaking each month a data sheet showing the work done, so that they might have the information should similar jobs arise in their district. Substantial business had been obtained by several subscribing undertakings. One undertaking with reasonable trade conditions had obtained an industrial load of 25 million c.ft. per annum, another 1 million c.ft., and their latest recruit had a fair prospect of additional sales of 50 million c.ft.

There was not the slightest doubt about the necessity for a campaign, because they could not look for an automatic increase in domestic sales for ever. They must leave no avenue unexplored, and the commercial and industrial avenue had tremendous possibilities, but any Industrial Scheme was incomplete without a National Co-Ordinating Scheme.

There had never been a period in the history of industry when more consideration had been given to the importance of heat treatment. The cry now was for "cheap heat" rather than "cheap power." No one could study the present industrial conditions without coming to the conclusion that the great advantages of gas would carry more and more weight as time went on, and that its use in industry would grow in increasing volume if (1) they sought the business in an organized manner and pooled their knowledge and experience; and (2) they offered the right price.

With regard to the latter point, if legislative effect were given to the recommendations contained in the Second Interim Report of the Gas Legislation Committee, the Gas Industry would have the freedom it wanted to put into operation any method of charge that it desired.

Support from South Wales and Monmouthshire.

Mr. H. D. Madden (Engineer and Manager, Cardiff Gas Light and Coke Company) said that the members of South Wales and Monmouthshire had met the previous week in Cardiff and discussed the whole problem under consideration that day.

The views which he had been instructed to voice were in full accord with those advocated by Sir David, Mr. Cash, and Mr. Gibson, and he did not, therefore, propose to reiterate them.

He would like to amplify one point with regard to Development Centres. Undertakings were already finding it a very great help to call on these centres, and he felt that they should all support them financially. More staff was wanted. The present staff was insufficient to gather the harvest. The number of inquiries from their contributing members was really marvellous. In his own area, undertakings were continually calling upon his staff to go out and advise on heating problems—such as tinplate works, rolling mills, sheet annealing, steel plates. Such demands necessitated additional highly trained men.

Mr. Madden mentioned a load of 50 million c.ft. a year

which his Company had obtained in competition with electricity at one-fifth of 1d. per unit. There was an enormous field, not necessarily wholly on a large scale, but in such directions as central heating, &c. There could be no doubt as to the necessity for the proposed machinery.

He would like them to consider another point, and that was the matter referred to by Mr. Gibson of the forthcoming visit of the Institution to the United States of America. He understood that the visit was mainly for the purpose of studying the uses of industrial gas over there, and bringing back to this country all the available statistics and information, and he hoped that all the Chairmen present would be sympathetic to those engineers who ought to go.

Major G. H. KITSON (Chairman, City of Leeds Gas Committee) said he would, in a few brief words, support the proposals put forward that afternoon.

He had always realized, from the very short time in which he had been concerned with the Gas Industry, how highly organized they were in their three National Bodies. That was no excuse, however, for not still further improving their organization, and he believed the step they proposed to take would mark a very definite move forward.

As Chairman of a Corporation Committee, he would have no hesitation when the time came in telling his Committee of the step taken and of pointing out what a splendid move it was.

Yorkshire, like other districts, had, of course, their own views, but he was happy to know that their view coincided almost exactly with what was being proposed to-day.

He did not intend to take up any more of their time, as another representative of Yorkshire, Mr. Bloor, would be able to supply them with any more details which they might desire of the views held by the Yorkshire district. He concluded by warmly supporting what he hoped would be a unanimous Resolution.

Mr. R. HALKETT (General Manager and Secretary, Sheffield Gas Company) said that the matter under discussion was one of very great importance to the company which he represented.

For thirty years they had had an industrial demand in Sheffield. They had recognized that if they wanted to get the business they must go out and seek it. They had in the past been only too pleased to give all available information to other gas undertakers, and would be pleased to continue to do so in the future.

He was heartily in support of the establishment of the proposed scheme, because he felt that the Industry urgently needed it. They had keen competition to face, and it was only by co-ordinated effort that they would be able to succeed.

In spite of trade depression everywhere, he was pleased to be able to say that for the past three years Sheffield had had an increase in sales. This was entirely due to their "pushing" the industrial load. They were aided by the fact that their city was very keen on abating the smoke nuisance. He had, on approval, installed for one firm two furnaces costing £1000 each, and if these were successful seven would be put down, which would consume approximately 500 million c.ft. of gas per annum.

They were just installing in another works three large furnaces which would consume 5000 c.ft. per hour. In regard to industrial heating, he strongly deprecated any promise being made which was incapable of fulfilment. It was better to indicate by performance what they could do, rather than by words.

With regard to the scaling and decarburizing of steel, he stated that they had designed a furnace for this very important purpose, and were pleased to report that within the past six months they had succeeded in overcoming the difficulties previously encountered, by taking full advantage of the waste gases from the furnace. Several manufacturers were now waiting for the Sheffield Gas Company to put this furnace on the market, which it was hoped to do in a very short time.

Mr. Halkett concluded by heartily supporting the Resolution.

Mr. S. E. HALLIWELL (Secretary, Bristol Gas Company) said that in Bristol they had specialized during the last six months on the development of the industrial load, and had prepared a list of 137 trades which represented over 2000 factories and works—in addition to a considerable number of consumers using gas for commercial purposes in the retail trades. They had organized systematic investigation by a competent staff for information and advice, and were preparing a complete census of "industrial" and "commercial" appliances.

The results had been very satisfactory, and there was every indication of an increasing demand for the use of gas in Bristol's industries.

They would be very pleased to co-operate with the West of England undertakings in any practicable scheme.

Mr. H. E. BLOOR (Engineer, Manager, and Secretary, York Gas Company) warmly supported the Resolution, and pointed out that he had been largely responsible for the proposals under consideration.

He emphasized that it was not sufficient to provide machinery for securing business for purposes for which gas was already known to be satisfactory. It was necessary to make it generally known that gas was capable of fulfilling many functions for which it was not generally employed at the present time. In this connection Mr. Bloor instanced "air-conditioning." He also pointed out that as a result of his personal contact with representatives of the Master Bakers' Association, he was of the opinion that the potentialities of gas were not adequately appreciated in the baking trade. The position was, in his opinion, similar in regard to the printing trade.

Mr. Bloor read a Resolution which had been passed at a meeting in Yorkshire, which supported the proposals submitted that afternoon.

Alderman J. H. WADDINGTON (Chairman, Halifax Corporation Gas Committee), while expressing himself personally in favour of the scheme, said that his duty would not permit him to vote for the Resolution, which would necessitate additional expenditure by the Corporation. He would have to obtain the views of his Committee.

He stressed the desirability of the use of the words "Gas Development" in connection with the proposal under consideration.

Dr. C. M. WALTER (Engineer-in-Charge, City of Birmingham Industrial Research Laboratories), in support of the scheme, made special reference to the work of the centres which had already been formed, including Newcastle, Cardiff, London, and Birmingham, and in view of his close associations with the work carried out and the collaboration between these centres, was anxious to emphasize the fact that, while centres in other districts had not yet been formed, it did not detract from the very good work which had already been done, and which had resulted in certain undertakings having built up industrial loads of considerable magnitude.

He also referred to the fact that Birmingham was already assisting some ten undertakings by special arrangement, and that the suggestions which had been made would appear to be the only possible way of developing industrial business on sound lines.

He then mentioned particularly that he had been present at the inauguration of the Cardiff centre, and had been impressed by the good work for which this centre had since been responsible.

With regard to Birmingham, he mentioned that the growth of the industrial load during the last twenty years, from approximately 600 millions to 3500 millions, had only been accomplished by intensive service among the manufacturers of the city, on the lines of the scheme now under consideration, and stated that too much importance could not be attached to the carrying out of experimental work on manufacturers' premises on a full scale, apart from the laboratory tests which would always be necessary to obtain certain experimental data.

He also referred to the fact that service of this kind was essential from another point of view, in so far as it had to be remembered that we had not only to extend our present industrial business, but retain that which had been built up in times when competition was not so severe.

He mentioned that the Gas Industry could not allow obsolete furnaces to remain on consumers' premises at the present time, as apart from being a bad advertisement for the Industry, they might, at some time or other, be used by competitors for comparison purposes to the disadvantage of the Gas Industry.

In conclusion he referred to the spirit of co-operation between the three existing centres at the present time, with a view to increasing industrial business, and hoped that the same spirit would be extended to other centres as they were formed, which would lead to the realization of the ideals now set out in the scheme under consideration.

Mr. J. W. Barnett (Cheltenham), Mr. W. T. Dunn, and Mr. George Helps (Nuneaton) also supported the Resolution.

THE RESOLUTION CARRIED.

Reviewing the discussion the CHAIRMAN (Sir David Milne-Watson) said: I can assure Alderman Waddington that we are certainly not anxious to have him spending money unwisely. "Cast thy bread upon the waters; for thou shalt find it." . . . I am sure Halifax will not grudge the money when it is going to reap an ample harvest.

With regard to the Yorkshire Resolution, it was practically in favour of the objects of this meeting to-day, with the addendum that this body should appoint certain experts. That is a matter which will have the very serious consideration of the Committee which will be responsible for setting up the machinery. There is everything to be said in favour of the suggestion.

The Chairman then moved the following Resolution,

which was seconded by Mr. R. E. Gibson, supported by Mr. Wm. Cash, and carried *nem. con.*:

Resolved—

(1) That this Conference of over 400 representatives of the National Gas Council, the Institution of Gas Engineers, and the British Commercial Gas Association, having heard the statements by the Presidents of these three bodies, and having also heard reports of the schemes which are now being operated in various parts of the country for extending the use of gas for all purposes, and particularly for commercial and industrial purposes—
   (*a*) accord its whole-hearted approval to the policy outlined of closer co-operation;
   (*b*) recommend the immediate establishment of Development Centres in those districts where these do not at present exist;
   and
   (*c*) urge every gas undertaker to support such centres in every way, and in particular by contributing to their maintenance.

(2) That the National Gas Council, the Institution of Gas Engineers, and the British Commercial Gas Association, be requested each to nominate five members to form a Joint Co-ordinating Committee for the purpose of giving effect to the foregoing Resolution.

A vote of thanks to the Chairman (Sir David Milne-Watson) was moved by Alderman J. H. LLOYD, seconded by Mr. CHAS. F. BOTLEY, and carried unanimously.

Bristol's Temporary Showrooms—A Fine Effort

The rapid growth of the Bristol Gas Company's business has necessitated the provision of increased accommodation at the Colston Street Offices and Showrooms. To ensure the necessary facilities for efficiently dealing with the increasing demand for gas appliances, the Directors have decided upon a scheme of reconstruction. This work, when completed, will provide the city with one of the most modern gas showrooms in the country. For the convenience of consumers during the alterations, temporary showrooms have been opened at the new Y.M.C.A. Central Buildings, Colston Street. These premises have been specially adapted for the display of all types of modern gas appliances. Our photograph shows the temporary premises; and we learn that since they were opened on Feb. 13 *the attendance has averaged over* 200 *a day.*

The Industrial Uses of Gas*

By Col. W. M. Carr, T.D., M.Inst.Gas E., Engineer, General Manager, and Clerk, Stretford and District Gas Board.

It is impossible to describe the multifarious uses of Industrial Gas in a single communication even were it possible for anyone to fully appreciate to what extent gas is, and can be, used in industrial heating.

It is proposed, therefore, to broadly discuss recent developments in the industrial use of gas, its efficiency and advantages as compared with other fuels.

In a paper on the "Development of the Sale of Gas for Industrial Purposes," which the writer was privileged to present at the Annual Meeting of the British Commercial Gas Association in September, 1932, the commercial aspect of the sale of gas to industry was dealt with, and it was therein suggested that the manufacturer of to-day requires a fuel of constant quality that can be accurately and scientifically controlled, and that it is the prerogative of the Gas Industry to supply this fuel manufactured from coal, which constitutes the greatest part of our national mineral wealth. Much has been done in the last year, and considerable progress has been made in the extended use of gas for industrial purposes in spite of the industrial depression, as, for example, the development in the use of town's gas in the Steel Industry on the Tyneside, and South Yorkshire areas, and in the Tinplate Industry in South Wales.

We, in the Gas Industry, are perhaps not a little to blame that the general use of gas on a large scale in industry is only now commencing. We have all too often permitted our competitors to compare fuels on a heat unit basis, and to discount the economies and efficiencies of clean gas fuel, which can be turned on at will, and accurately controlled to give maximum production and quality of products.

It is true to state that in the past gas has suffered to a great extent from misapplication, and it is necessary that the gas supplier should be prepared to investigate each individual usage, and advise as to the most suitable design of appliance and burner equipment to suit any heating process, and to best conform to the working conditions existing in the factory. It is impracticable to lay down any hard and fast rule as to a particular standard type of appliance that may be suitable, and in the majority of cases, the appliance requires to be specially designed to conform to the users' requirements if a high overall efficiency is to be obtained.

Gas has particular advantage over oil and solid fuels in that complete combustion can be obtained with or without the use of secondary air supply.

It has frequently happened that gas is applied without due consideration of this factor, and one has seen, for example, lead pots heated by atmospheric burners with uncontrolled secondary air supply, carrying the products of combustion away without sufficient time for heat transference, whereas had the same pot been enclosed in a furnace heated by pressure burners, utilizing primary air only to give a complete combustion mixture, and operated under pressure, the efficiency would have been trebled; other factors effecting the efficiency of appliances are the design of the oven, furnace, or container and its capacity in relation to heat throughput, the product to be treated or melted, and the travel and volume of the heating gases. Further most important considerations are those of insulation, recuperation, pre-heating of products and temperature control.

In comparing the values of industrial fuels, the particular requirements of the user are the first consideration.

The following are, however, general considerations as affecting all fuels:

1. Convenience.
2. Ease of control.
3. Consistency in supply.
4. Efficiency.
5. Cost.
6. Service in use.

1. *Convenience.*

All fuels, other than gas and electricity, may be considered as intermittent from the point of view of supply, and storage is required varying in complexity according to the size and situation of the heating plant in relation to the source of fuel supply. This means the provision of available works space, and additional handling cost, which should be incorporated in estimates when comparing relative values. Wastage, in the case of town's gas, is reduced to a minimum, as the supply is available at the point of user as and when required.

A gas furnace usually occupies less space than one operated with solid fuel; moreover, it is adaptable for inclusion in continuous processes of manufacture.

2. *Ease of Control.*

Ease of control of any fuel is dependent upon the consistency of its quality and cleanliness. It is possible, with modern thermostats, to secure absolute control of gas-heated appliances to maintain constant temperatures under varying conditions of load.

The disadvantages of solid fuels in heating processes requiring fine adjustment of temperature and furnace atmosphere are apparent. Town's gas of constant density and quality lends itself to easy control of temperature conditions, and more important still, of furnace atmosphere. Oxidizing neutral or reducing conditions can be maintained as required; it should not be overlooked, however, that the highest efficiency of combustion is obtained when the air used for combustion nearest approaches the theoretical figure, and control of atmosphere is often most efficiently obtained by means of an independent gas supply; particular reference to this point is made later in the description of forging furnaces.

The control of oil burners requires more careful attention than gas, occasioned by variation in viscosity under varying external temperature conditions, and a neutral and reducing furnace atmosphere cannot be maintained as with gas.

The furnace atmosphere in an electric furnace is of necessity oxidizing unless artificial atmospheres are produced by extraneous means such as the use of inert gases, &c.

3. *Consistency.*

It may be fairly claimed that town's gas, as supplied in the principal industrial areas of the country, is to-day the most consistent fuel. It is, however, reasonable to here emphasize the necessity of maintaining a supply of gas of constant composition, calorific value, and density, and at a constant pressure. In intense industrial areas, the distribution of high-pressure gas is extremely desirable, as, in large works, is the installation of governors on every piece of apparatus to ensure constant pressure conditions.

The supply of electricity in many areas is subject to considerable variation in voltage, and sometimes temporary failure in works where there are heavy and variable electric loads.

Oil is subject to considerable variation in consistency under varying atmospheric conditions, and also as to quality.

4. *Efficiency.*

Overall efficiency of a fuel is by no means dependent upon primary cost, but rather upon efficiency in utilization of which the prime fuel cost is an integral part. Comparison of fuels on a heat unit basis only is essentially wrong, and there are many cases, some of which are cited in this paper, in which gas has successfully displaced oil, steam, and solid fuel due to increased efficiency in application.

The importance of furnace design upon overall efficiency cannot be over-emphasized; careful study and investigation is necessary in all cases to ensure—

(1) That the best method of applying heat is adopted.
(2) That the correct type of heat is employed.
(3) That the most suitable burner is used, and produces the type of heat required.
(4) That the insulation is such as to reduce losses to a minimum.
(5) That the atmosphere of the furnace will be such as to yield the best product.
(6) That the flow of the products of combustion and gases within or around the heating surfaces are such as to ensure the maximum absorption of heat.
(7) That the design and shape of the container is such as to ensure the maximum efficiency of heat transference.
(8) That the design is such as to minimize the labour entailed in the handling of the product.
(9) That the output of the furnace will conform with the production rate of the process in connection with which it is employed.
(10) That the conditions of control are simple, and as far as possible, fool-proof.

Finally, the desirability of securing the best atmospheric

* Paper at the Joint Gas Conference, British Industries Fair, Birmingham, March 1, 1933.

and working conditions in the vicinity of the furnace itself cannot be over-emphasized as production is, in a great measure, dependent upon comfortable conditions for the worker.

5. *Cost.*

The importance of the industrial gas load as a balancing load is becoming more generally appreciated, and the writer would again venture to repeat the opinion that it is obviously wrong to base charges for industrial supplies on the average cost of supplying the domestic load. It is not proposed, in this communication, to deal with the question of charges as the writer had the privilege of expressing his views on industrial gas charges in his paper presented to the British Commercial Gas Association last year.

The writer believes that, in fixing a charge, the influence of any load in balancing and reducing standing charges should be an important consideration as should the diversity factor of any demand in relation to the peak demands of the undertaking.

The cost at which gas can compete in any process is, as has been pointed out, dependent upon the efficiency of its application, and, therefore, no hard and fast rule can be laid down as to the price at which gas should be sold to compete with other fuels.

6. *Service.*

If gas is to take its true position as the principal industrial fuel of this country, it must of necessity be backed up by efficient service. The securing of new load and business is useless if existing business is not held; therefore, a gas undertaking's industrial organization should provide for the inspection and maintenance of existing installations. It should arrange to pass on to its existing consumers all information as to improvements that may possibly be adopted to increase the efficiency of existing appliances.

The establishment of mutual confidence between the gas undertaking and the manufacturer is of paramount importance, and the manufacturer should be encouraged, at all times, to look to the gas undertaking for advice and guidance in his heating problems. Instances are given later in this paper illustrative of special furnaces, which have been designed and manufactured by the Stretford gas undertaking as a part of the service in the selling of industrial gas.

Producer Gas and Town's Gas.

In steel and other works engaged in bulk heating, producer gas is extensively used, and can be produced on a large scale at a low cost; where working, however, is not continuous, the cost of producer gas rapidly increases, and the tendency is growing for the manufacturer to look to the gas undertaking for a supply of clean, easily controlled fuel.

Producer plants have been discarded in favour of gas in several instances, and later in this paper a brief description is given of the conversion of a bright wire annealing furnace at a Stretford factory previously fired by a Siemens type built-in producer.

A most interesting case of the conversion to town's gas of a producer gas-fired furnace at a steel works in Newcastle-on-Tyne is described in detail in the Industrial Gas Supplement of the "Gas World" of the 21st January, 1933, and the results there given are indicative of what may be accomplished by careful consideration of factors relating to particular application. The gas consumed per ton of steel rolled over a period of nine days, including gas used for heating-up, is given as 16·88 therms, as compared with 3½ cwt. of coal with producer gas firing. It is further reported that the results obtained have keenly interested other rolling mill owners in that area.

Electricity.

In the foregoing very general remarks on the estimation of fuel values, reference has been made to electric furnaces. Electricity is primarily power, in this country originally produced from heat, and requires re-conversion to again become a heating agent, and for this reason it cannot be looked upon as a serious competitor in large-scale heating; where, however, it can be directly applied in such processes as welding and spot heating, the efficiency obtained is such as to render it a most economical and efficient heating agent.

Oil.

Oil is more portable than solid fuels, and whilst not so adaptable or efficient as town's gas, it is extensively used, particularly on account of low first cost backed up by the very good service organizations of the oil companies, which are an example to the Gas Industry in the assistance given to oil users to obtain the most efficient burning appliances.

Home-produced fuel in the form of town's gas can, and is, successfully competing with oil in the industrial field, and it has so many advantages that it must eventually displace oil for heating operations provided the Gas Industry continues its efforts to develop the industrial field by improving the efficiency of utilization, and making its charge on an economic basis in direct relation to the cost of supplying a particular load.

The importance of furnace design in securing efficiency has already been indicated, and no apology is needed, therefore, for including in this paper a description of the principal types of burners in general use.

Burner Systems and Types of Burners.

The selection of the most suitable type of burner is an important consideration in the design of an industrial installation, and such selection is dependent, in the main, upon the nature of the heating process and the required working temperature. Industrial gas burners in general use may be divided into four main groups:

1. Atmospheric or natural draught burners.
2. High-pressure air and low-pressure gas burners.
3. High-pressure gas and low-pressure air burners.
4. Premixed gas and air burners.

Atmospheric Burners.

Atmospheric burners are generally utilized for work requiring a large volume of products at a relatively low temperature. The conditions required in drying and baking ovens are admirably met by an efficient atmospheric burner system. Gas at ordinary main's pressure, usually 3 in. W.G., is employed in entraining the primary air for combustion through a venturi mixer. The velocity of the gas at this low pressure is, however, insufficient to entrain all the air required for complete combustion, and a secondary air supply must be provided at the burner nozzle. The combustion efficiency is relatively low due to the difficulty of controlling the amount of secondary air. In burner installations of this type as much as 100% excess air is frequently admitted in order to fully combust the gas.

Natural draught burners are, in certain circumstances, successfully applied in low-temperature heat treatment ovens, the limiting temperature for this type of burner being approximately 1000° C.

The advantage of natural draught burners is that no auxiliary equipment is necessary, and they can be fitted at a very reasonable cost.

High-Pressure Air and Low-Pressure Gas Systems.

These burners may again be sub-divided into:

a. Gas and air blast burners.

b. Automatic air-gas proportioning burners.

a. Air blast burners may be described as those in which air under pressure of 1-2 lbs. per sq. in. is mixed with gas at ordinary main's pressure. Gas and air are controlled by cocks which are usually provided with setting indicators.

These burners are in general use for heating operations in which an intense and more or less localized heat is required. By control of the air and gas supply a setting may be found at which the amount of air required for combustion most nearly approaches the theoretical amount, and at which the gas rate is equal to the requirements of the heating operation involved.

The disadvantage of this type of burner is that in the event of variation in temperature or load re-adjustment of the air and gas supplies is necessary, and whilst the operator may be expert at judging the temperature of his furnace, he cannot be expected to obtain by hand manipulation the highest possible combustion efficiency. In addition, any variations in pressure of either gas or air may have the effect of changing the furnace atmosphere from oxidizing to neutralizing or *vice versa*, which might result in spoilt work.

b. Automatic Air-Gas Proportioning Burners.

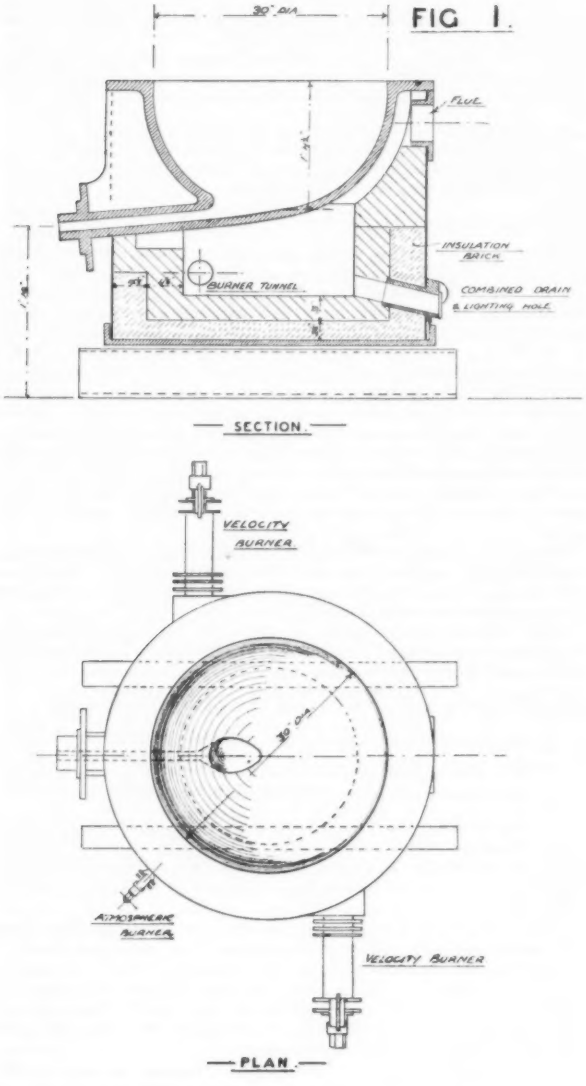
These burners have all the advantages of air blast burners without the disadvantage last mentioned. They provide over a fairly wide range of consumptions a correct and constant ratio and an intimate mixing of gas and air. Air under a pressure of 1-1½ lbs. per sq. in. is passed through a venturi throat, at the restriction of which an entry for the gas is arranged. The velocity head of the air passing causes a suction on the diaphragm of a governor valve, through which the gas is admitted. A fine adjusting valve is also fitted to the venturi throat or inspirator by means of which the gas and air can be mixed in the correct ratio. Any increase in air pressure causes a corresponding and proportional increase in the suction exerted on the gas admission governor, and therefore the

ratio of the gas and air in the mixture remain the same over a fairly wide range. The mixing chamber and mechanism can be arranged to feed either one or a number of burner nozzles depending upon the application. The burner can be adjusted to give either an oxidizing, neutral, or reducing atmosphere, and it is admirably suited for all heating purposes in which a high heat potential with a small volume of combustion products is required.

High-Pressure Gas and Low-Pressure Air System.

This type of burner is like the atmospheric burner, simple in construction. Gas at pressures of 1-5 lbs. per sq. in. is

FIG 1.



30 INCH (25 CWTS) LEAD POT.

used, and its velocity at these pressures is such that sufficient air for complete combustion is entrained from the atmosphere through a venturi throat. Complete control over combustion is assured with a minimum of equipment, *i.e.*, no automatic governing device is required and a compressor to deal with only one-fifth the volume of air used for combustion is sufficient.

Its one disadvantage is evident. To maintain combustion without lighting back the velocity of the air-gas mixture passing through the venturi throat must be in excess of the rate of flame propagation of the mixture. Thus these burners cannot be operated over a wide range of consumption, and the use of thermostatic control equipment with this type of burner may lead to trouble due to back-firing on very low consumptions. Auxiliary burners of the atmospheric type are often employed in conjunction with these pressure gas burners, as in the case of lead-melting furnaces later described.

Premixed Gas and Air System.

This system is a direct modification and combination of the pressure air and pressure gas systems. The plant consists of a gas and air mixture compressor giving automatic control over gas, air, and mixture pressures and volume ratios under all rates of consumption. The mixture of gas and air is normally in the proportion of 1 to 1½, and a supply of air necessary to complete combustion is admitted at the burner by means of an ordinary atmospheric injector. The mixture is not explosive, and one premixing machine usually supplies a number of furnaces. In such a case, however, the plant must be run when only a number of furnaces are in operation, with consequent increased consumption of power.

It is impossible, as already indicated, to attempt to describe the multifarious uses for which gas is at present employed in industrial processes. It is proposed, however, to endeavour to describe a number of installations where furnaces fired by oil and solid fuels have been discarded in favour of gas or converted as these serve best to illustrate the value of gas as compared with other fuels.

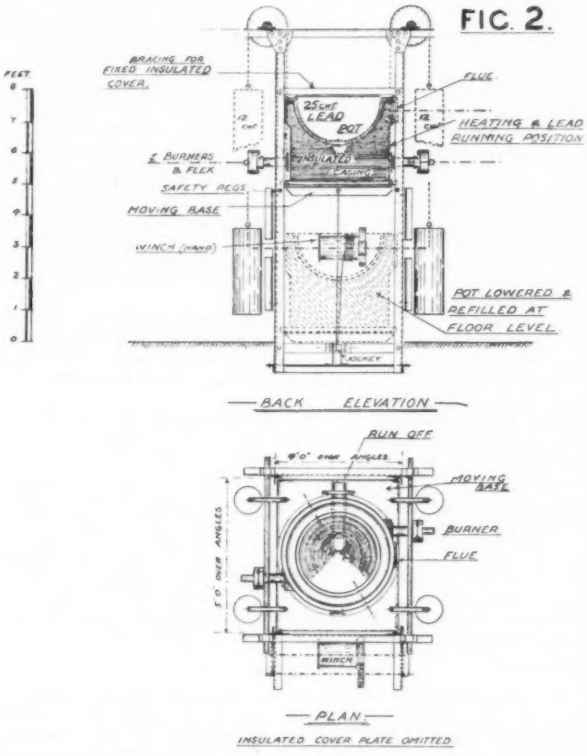
Soft Metal Melting.

In one factory in Stretford gas has displaced oil and solid fuel for lead melting solely on the grounds of efficiency, and in another lead works gas is the only fuel used for melting purposes. The furnaces utilized in both these instances consist of a cast-iron pot built into a circular firebrick-lined steel-encased combustion chamber. The firebrick lining is backed up by a layer of heat insulating brick, by means of which radiation losses are reduced to a negligible amount.

The general design of these furnaces is shown in fig. 1. Two burners are fitted to each furnace, of the high-pressure velocity type, utilizing town's gas at a pressure of 2 lbs. per sq. in. and entraining the necessary air for combustion from the atmosphere by means of a venturi throat. These burners fire tangentially into the combustion chamber, which consists of a circular firebrick-lined cavity below the bottom of the pot.

An atmospheric burner is also provided for the purpose of maintaining the lead in a molten state during standby periods.

FIG. 2.



LEAD POT RAISED FOR HEATING & RUNNING, LOWERED FOR CHARGING.

The diagrams and photographs illustrate two adaptations of these furnaces to different processes. In one case, illustrated on plate 1, the furnace is erected on a permanent steel charging platform at a height of 6 ft. from the floor.

In the other case, shown in fig. 2 and illustrated on plate 2, the furnace is mounted in a framework, with lifting gear operated by a hand winch which enables the furnace to be lowered for charging, and raised into an elevated position for running the lead into a press. In the factory first mentioned there are eight gas-fired pots of

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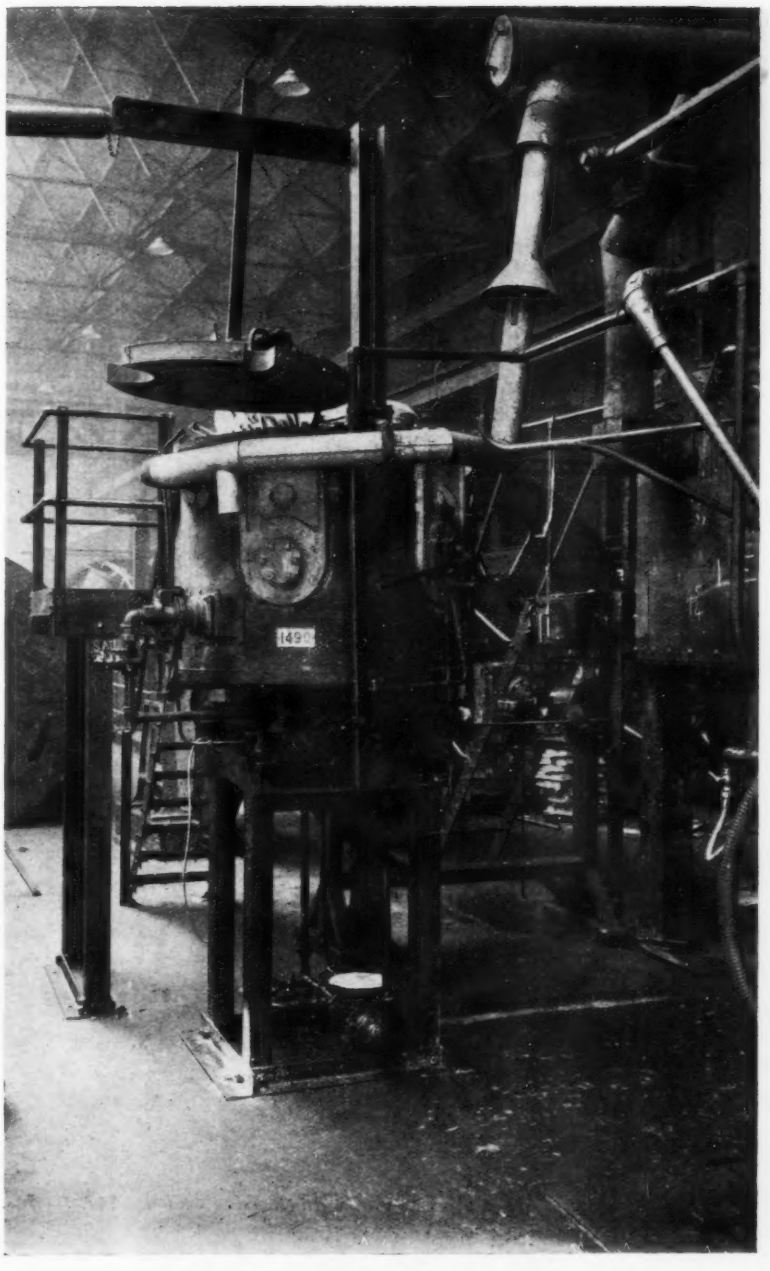


PLATE 1.—*25-Cwt. Gas-Fired Lead Pot.*

25 cwt. capacity and three of 3 ton capacity which have been installed during the past four years in replacement of solid fuel and oil-fired pots. There still remain three oil-fired pots to be replaced, and one of these is seen on the right of plate 1. Works tests extending over a period of two weeks carried out on the first gas-fired pot installed gave the following results:—

Total lead run, including re-melt = 58·1 tons.
Total pig lead melted = 39 tons.
Total gas used = 22,733 c.ft. = 114 therms.
Gas used per ton of run lead = 1·955 therms.

During the last year the amount of gas used per ton of lead run on all furnaces, including approximately 33⅓% re-melt, has been under 3 therms per ton. This amount includes gas used during standby periods, during starting up, and also in burners utilized for heating the discharge spouts and lead presses. The consumption for these purposes is considerable, and accounts for much of the difference between the annual and test melting figures.

The amount of oil used per ton of lead run is given as 5 gallons per ton of lead melted, inclusive of maintenance heating through the night. It should be noted that gas burners are used for the heating of the discharge spouts and presses on the oil-fired pots, and therefore it will be seen that the equivalent gas for melting is approximately 2 therms.

The reason for the much higher efficiency of the gas-fired pots is that the furnaces are totally enclosed, the whole of the air for combustion is admitted as primary air, and the furnaces are worked under a slight pressure. In the case of the old oil-fired pots secondary air is used of necessity, and, in consequence, the efficiency is reduced proportionately.

The speed of melting, ease of control, and general efficiency has persuaded this firm to convert all oil furnaces to town's gas.

Conversion to Gas of a Continuous Steam-heated Process Oven.

The Continuous Process Oven, shown on fig. 3 and illustrated on plate 3, is used for processing laminated stampings for electric motor and dynamo core plates after spraying with insulin—a mixture of China clay and size in water.

The oven is 27 ft. 6 in. long and 5 ft. 9 in. wide, composed of steel casing and framework mounted on a brick chamber which contained the original heating units consisting of steam coils, which were built up from 2 in. dia. steel tubes in a battery 14 tubes wide and 8 tubes deep. A disadvantage of the steam-heating unit was, that it was neces-

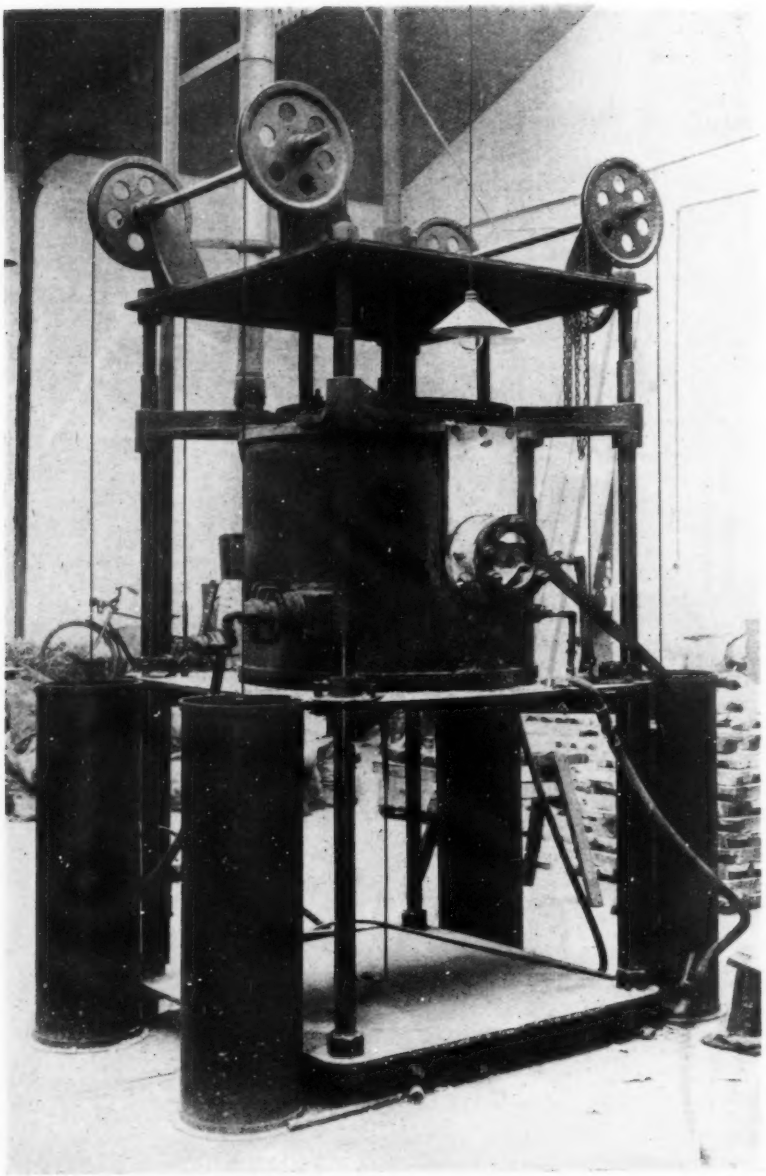


PLATE 2.—*25-Cwt. Gas-Fired Lead Pot with Raising and Lowering Gear.*

sary to clean each week the steam tubes, which became coated with insulin falling from the conveyor chains.

The conveyor is composed of twenty-two light chains spaced at 3 in. centres running the length of the oven proper and extending 4 ft. 6 in. at each end for charging and discharging. The stampings are laid flat on the conveyor and sprayed immediately before entering the oven by a swinging arm spray, operated by the conveyor motor. The work is discharged perfectly dry and with a clean porcelain finish. The flat stampings treated in this oven are passed through twice for the treatment of both sides. The conveyor runs at a speed of 10 ft. per minute.

The gas burner equipment installed consists of four 1-in. burner tubes drilled with double rows of ⅛-in. holes at 1-in. centres; no injectors are fitted as this Works is equipped with a premixing plant, a partial air-gas mixture being distributed through the factory. The burners are spaced at 19-in. centres, and are situated near the centre of the oven. Thermostatic control of the direct non-expanding rod type is fitted, and the products of combustion are vented at both ends of the oven by natural draught. Dust extraction gear is installed above the spraying chamber, and does not interfere with the draught conditions of the oven.

When gas firing was adopted for the process a plate was fixed just above the steam coils, forming a bottom to the oven some 10 in. below the conveyor return. The burners are placed above this bottom plate below the conveyor and protection shields are provided 3 in. above the burners to prevent insulin falling from the chain and blocking the burners. Cleaning is now a matter of scraping the bottom plate every month—a simple operation compared with cleaning the steam coils.

Test Results.

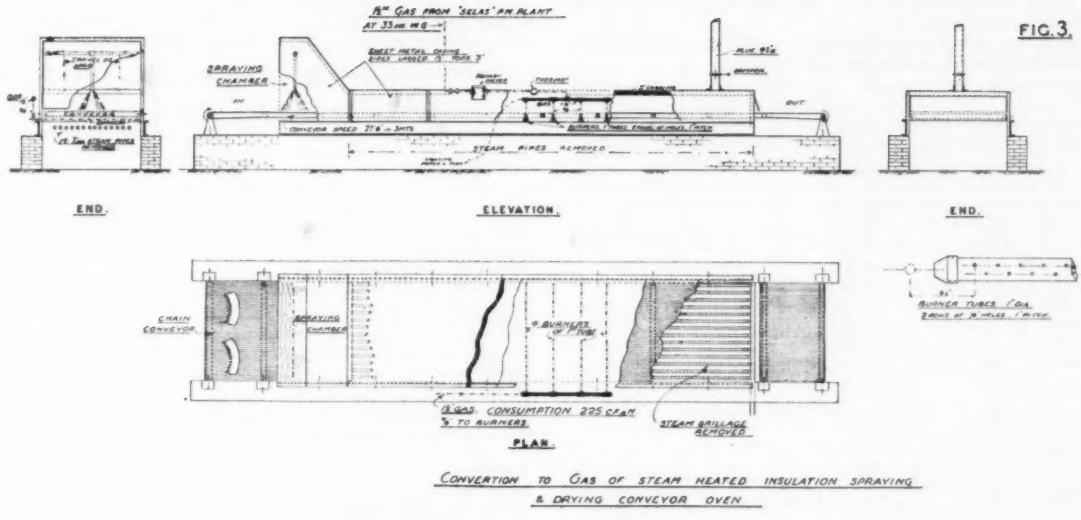
No actual data are available as to the steam consumption of the oven prior to conversion. The users estimate, however, that some 300 lbs. of steam per hour at 120 lbs. pressure were used, and taking the normal throughput of 1 ton per day of 8 hours, this is equivalent to 1·07 lbs. of steam per pound of products treated.

The following are the results of working with gas heating, giving an even oven temperature of 250° F.:—

Date.	Material Treated. Weight in Lbs.	Gas Consumption C.Ft. (C.V. 500 B.Th.U. per C.Ft.)	Gas per 1 Lb. Product.
Dec. 12	2040	750	0·3677
,, 13	2150	780	0·3628
,, 14	2450	920	0·3756
,, 15	2200	800	0·3637
,, 16	2380	860	0·3614

Assuming a low steam cost of 18 pence per 1000 lbs. and gas at 6d. per therm, the comparative costs per ton of product are steam 43·2d., gas 24·3d. per ton.

This conversion illustrates the possibility of savings to be effected by conversion from steam to gaseous heating where the existing appliances are well insulated.



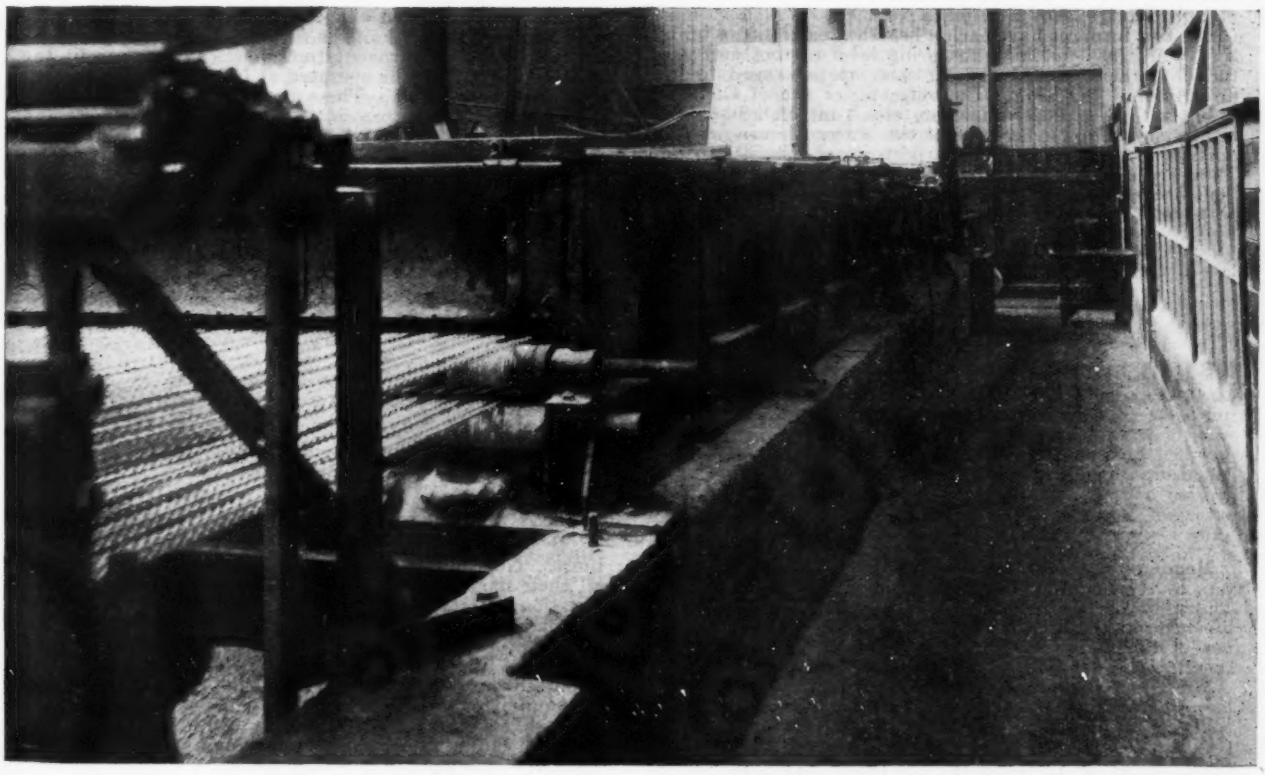


PLATE 3.—*Gas-Fired Conveyor Type Process Oven.*

Continuous Drying Oven for " Hyrib " Sheeting.

The oven, which is illustrated on plate 4,* is of the continuous type, and was particularly designed for the purpose of drying " Hyrib " sheeting used in reinforced concrete construction work. The sheeting is cut, rolled, and stamped from flat plate in two or three operations, depending upon the gauge and width. The sheets are cut cold, and emerge from the cutting machines dripping with water, and require to be thoroughly dried before being given a preservative coating.

The oven was designed and built in the workshops of the Stretford Gas-Works. The detail of the design is shown in fig. 4.* It consists of two chambers, one superimposed on the other with gas burners fixed in the lower chamber. The chambers are of different widths to permit of two standard-sized sheets being dried at the same time.

The length of the oven is 16 ft. 6 in., with the gas burners situated in the first 10 ft. length. There are eight burners of ½ in. pipe drilled with double rows of ⅛ in. holes at 1 in. centres. These burners extend across the width of the oven and are spaced 15 in. apart. Lagging is provided on the top and two sides of the oven; the bottom consists of loose plating which can be withdrawn for cleaning, and for the easy removal of sheets should they jamb or buckle when being fed through by the roller-jaw machine which is situated at the feeder end. This machine passes the sheets through at the rate of 1 ft. per second; they slide along the channel guides, each sheet pushing the preceding sheet to the discharging end of the oven.

A thermostat of the expanding rod type is provided, and all gases are drawn by natural draught to the discharge end and vented to the atmosphere by one flue only. The working temperature of the oven varies from 275° F. to 325° F. according to the type and size of sheeting to be dried. This particular oven is cited as being illustrative of circumstances so often arising which necessitates the designing of an appliance to suit the user's requirements. It

* These will be published in next week's " JOURNAL."

is also a good illustration of the adaptability of gas heating to continuous process work.

The following are the results of a working test of this oven extending over a period of one week:—

Date.	Sheets Dried. No.	Gauge.	Width	Length.	Total Weight in Lbs.	Gas Consumption in C.Ft. (C.V. 500 B.Th.U. per C.Ft.)	Gas Consumption per Lb. of Metal Dried.
			Ins.	Ft. Ins.			
14th Nov.	178	24	11¾	9 0	7,438	1900	0·2555
	314	28	,,	6 0			
	1008	28	,,	8 0			
15th ,,	8	24	,,	6 0	7,908	1400	0·1770
	824	24	,,	9 0			
	154	28	,,	10 0			
16th ,,	309	24	,,	12 0	6,798	1500	0·2207
	312	24	,,	11 0			
	2	24	,,	13 0			
17th ,,	1152	24	,,	6 0	6,567	1600	0·2436
18th ,,	44	24	,,	6 0	6,270	1700	0·2711
	576	24	,,	11 0			
Total per week . . .				—	34,981	8100	0·2316

A typical example of the advantageous replacement of oil-fired furnaces by gas furnaces is illustrated by the installation of two gas-fired furnaces producing heavy drop stamp forgings, shown on plate No. 5.*

The two furnaces have each a hearth area of 3 ft. 6 in. by 3 ft. 3 in. by 9 in. high to spring level of roof arch; six tunnel burners, three on each side, are arranged to fire directly into the arch. The refractories are of Glenboig lining with a magnesite flooring and 3 in. of "Sil-o-cel" insulation. The burners are of the automatic air-gas proportioning type, using air at a pressure of 1 lb. per sq. in. They are principally used for the manufacture of turbine blades varying in weight from 8 to 20 lbs. each at temperatures from 1050° C. to 1330° C.

* This will be published in next week's "JOURNAL."

The following test figures give comparative consumptions of the gas and oil fired furnaces of similar size, and working on a similar output over a period of six working days:—

Comparison of Tests on Oil and Gas-Fired Forge Furnaces.

Calorific Value . . Oil—19,100 B.Th U. per lb.
Gas—500 B.Th.U per c.ft.

—	Oil.	Gas. Without Purging Burners.	Gas. With Purging Burners.
Period of test	6 days	6 days	3 days
Weight of metal heated during working period of 8 hours per day	7512	7734	4523
Consumption in heating up to working temperature .	143 galls.	18,790 c.ft.	..
Consumption during working period.	212 ,,	38,150 ,,	18,164 c.ft.
Total consumption . . .	355 ,,	56,940 ,,	..
Total consumption per 1000 lbs. of steel heated . . .	47·3 ,, 80·9 therms	7,360 ,, 36·8 therms	.. ..
Consumption per 1000 lbs. of steel (working periods only)	28·3 galls. 48·4 therms	4,950 c.ft. 24·75 therms	4,016 c.ft 20·08 therms

The figures of gas consumption obtained at the time of the original comparative test of six days were afterwards greatly improved upon, as, during these tests, the necessary reducing atmosphere was obtained in the gas furnaces by admitting excess air through the main burners at the expense of combustion efficiency. Three purging burners were fitted at the back of the furnace to introduce raw gas for the control of furnace atmosphere, and so permit the main gas burners to be operated at full efficiency under all conditions of working. These purging burners, which are of nickel steel, have proved very satisfactory in use, and the results of a three days' working test, after the fitting of the purging burners, are shown in column 3 of the table.

It will be observed that there is a marked decrease of no less than 18·8% in the working period with the purging burners in operation.

(To be concluded.)

THE JUNIOR ASSOCIATIONS : : AT THE FAIR : :

Mr. R. E. Gibson's Address at Luncheon

Members of the Junior Gas Associations from all quarters of the country converged upon Castle Bromwich on Thursday of last week, when they were entertained at luncheon at the kind invitation of the Birmingham Chamber of Commerce, and spent a most interesting day inspecting the exhibits at the British Industries Fair.

Mr. Thomas J. Kennedy (Vice-Chairman of the Birmingham Chamber of Commerce) presided, supported at the top table by Mr. R. E. Gibson (President of the Institution of Gas Engineers), Mr. A. W. Smith (General Manager and Secretary of the Birmingham Gas Department), Mr. J. W. Wood (President of the Yorkshire Junior Association), Mr. H. C. Sims (Vice-President of the London and Southern District Association), Mr. F. H. Higton (Hon. Secretary of the London and Southern District Association), Mr. W. L. S. Spinks (Hon. Secretary of the Gas Industries Section of the B.I.F.), together with other Officers of the Junior Gas Associations, of the Birmingham Chamber of Commerce, and of the Management Committee of the Fair.

A Great Industry.

The Loyal Toast having been duly honoured, Mr. KENNEDY proposed the toast of "The Gas Industry," with which he coupled the name of Mr. R. E. Gibson, President of the Institution of Gas Engineers. "You belong, gentlemen," he said, "to a great Industry with a history and traditions, of which you should be, and I am sure you are, very proud. I think that no industry has ever been faced with a more formidable kind of competition than that which faced the Gas Industry in the earlier days of its development. A new and vital industry—the electrical industry—came into being and was increasing naturally and inevitably by leaps and bounds. What did the Gas Industry do? Did they retire behind such ramparts as they had, and fill the air with protestations and lamentations? No; they went out with their bands playing and all their flags flying. I say with great sincerity and admiration, 'Hats off to the Gas Industry!' You went into the market," continued Mr. Kennedy, "with new ideas and with new methods of advertising; better still, you obtained the best brains available to employ them in the all-important work of research. You improved your technical equipment, and you said, 'If we have to yield ground in the lighting of residential houses, we are going to show what we can do in heating and cooking and in other directions in which gas can be employed.'"

The Gas Industry's triumph, went on Mr. Kennedy—and veritably it was a triumph—was their co-operation in the British Industries Fair. In London there was the co-operation with His Majesty's Government (represented by the Department of Overseas Trade) and the manufacturers in the running of the Fair at Olympia; while here there was the co-operation with the Birmingham Chamber of Commerce, with the results which they saw in this magnificent Fair. The Birmingham Chamber of Commerce, which was the organization which financed the Fair, took a great risk; but one had to be bold in business as elsewhere, and the risk had been amply justified. This was the result of co-operation. The Gas Industry had always formed a very attractive and impressive part of the exhibits, and it was to be hoped that their exhibits would be extended in the days to come.

The Junior Associations were very valuable in the Gas Industry. Good technical training had been recognized—and was being increasingly recognized—throughout all the industries in the country, but more particularly had it taken root in the Gas Industry—and these Associations were the result. "Many of the members here to-day," concluded Mr. Kennedy, "are young men. The future is yours, and the earnestness which you put into your studies

to-day and the enthusiasm with which you regard your Industry will lead, I am confident, to the highest fulfilment of your hopes. I invoke you to go forward with stout hearts, and I wish you God-speed in your efforts."

Education in the Gas Industry.

Mr. R. E. Gibson, replying to the toast, which was enthusiastically accorded, said that he felt a heavy weight of responsibility resting upon him in having been entrusted with the duty of responding to the toast of "The Gas Industry." But he was glad to have this privilege, for, in his capacity of President of the Institution of Gas Engineers, it gave him the opportunity of addressing all the Junior Gas Associations together at one and the same time.

First of all, said Mr. Gibson, let me express on behalf of the representatives of the Gas Industry here present our warmest thanks to Mr. Kennedy for the kind and generous terms in which he proposed the toast, and to the President and Council of the Birmingham Chamber of Commerce and the Fair Management Committee for their hospitality here to-day. It is in keeping with their reputation for hospitality which has been established during the last few years, and we are greatly indebted to our hosts on this occasion.

As President of the Institution, continued Mr. Gibson, I should like to say that the Institution of Gas Engineers, as represented by its Officers and Council, take a lively interest in the activities of the various Junior Gas Associations. We recognize that they play an important part in the education and training of the younger members for their future work in the Industry. I hope the day is not far distant when the Junior Associations will become more closely related with the Institution and recognized as branches of the Parent Body.

I am glad to know that members of the Junior Gas Association are warm supporters of the Education Scheme of the Institution, and probably most of the successful candidates at the examinations are connected with one or other of the Junior Associations. The standard of knowledge now required is much higher than it used to be. That is to be expected having regard to the extended development of education in gas engineering and its ancillaries. There may be those among you who have found the course of study exacting and difficult. But there is nothing really worth having in this world without effort. The young man who is prepared to put his back into it will succeed sooner or later. The really efficient man is the man who is prepared by sheer will-power to devote his time to the mastery of the requirements of his calling. Generally speaking, we get out of life what we put into it. Those who do the little bit extra in fitting themselves for their work usually have their reward sooner or later. What the Gas Industry needs to-day more than anything else are thoroughly competent and well trained men. We need to get rid of that curse of drift and easy satisfaction which arises mainly from the lack of pride. Unless we take a pride in our work high standards are impossible. You will be thinking my remarks are too much like a sermon, but I feel like speaking in this way because, after a fairly long experience, I have observed what has happened in cases that have come under my notice. It may be that those who are present here to-day are so highly efficient that there is no room for improvement. If so I have been flogging a dead horse, but I think it would be nearer the mark to say that none of us are so near perfection that there is not any room for improvement. The fact that you are here to-day, I think, indicates that you are in quest of knowledge of the latest development in gas engineering plant and appliances, as well as of those in other branches of engineering. The British Industries Fair has established a great reputation, and there is a tremendous lot to see—far more than some of us can examine thoroughly in the limited time at our disposal. I am quite sure that your visit to the Fair to-day will be very interesting and profitable to all of you.

About a fortnight ago a largely attended meeting of representatives of the Gas Industry throughout the country was held in London to consider the question of developing the use of gas for large and small scale industrial and commercial purposes. At that meeting the importance was stressed of having trained technical men available in the various districts capable of looking after such business. It was pointed out that in innumerable instances efficiences had been greatly improved by close attention to the technical details of the methods used, with consequent saving in the consumption of gas and the satisfaction of the consumer. Several examples were given of such attention leading to retention of business in the face of keen competition and the extension of further business.

Gaseous Fuel in Industry.

The use of gaseous fuel in industry is very extensive even now. Its applications to different trades and processes are legion, but I am sure there is still a large field for further development.

While we are met together to-day in the city of Birmingham, we cannot be unmindful of the great part the Birmingham Gas Department has played in developing the use of gas for industrial purposes. Many of the gas undertakings represented here must have received help, directly or indirectly, through the work of the Industrial Department at Birmingham, and we greatly appreciate all they have done and all the assistance they have rendered.

The Gas Industry in the past has suffered very much because gas appliances have often been fixed without any regard to efficiency or without being properly maintained. This is true with regard to industrial and domestic appliances, and especially to lighting burners. Where gas is used for industrial and commercial purposes on a large scale, it becomes a serious matter financially when there is loss of efficiency due to wrong methods of use, lack of proper insulation or excessive flue losses. In these days of keen competition with oil and electricity it is necessary for us to make sure that gas, both in existing and in new installations, is used with the maximum efficiency possible. I should like to suggest that in this direction there is a field of employment which should appeal to many members of the Junior Gas Associations. I believe that there will be many openings for young men who are prepared thoroughly to equip themselves by suitable study and training for such work.

The kind of business to which I have just referred really requires two men rolled into one—the technician and the salesman. If the technical man has no business qualifications and no aptitude for salesmanship he will not be entirely successful.

A few days ago I heard Viscount Leverhulme give a very apt and amusing definition of a technician and also of a salesman, which I must pass on to you. A technician, he said, is a man who knows a great deal about a very little, and goes on knowing more and more about less and less until he knows practically everything about nothing. A salesman on the other hand is a man who knows a very little about a great deal and keeps on knowing less and less about more and more until he eventually knows practically nothing about everything. How far these definitions are correct, I would not like to say. But for this industrial business there is no doubt that a good mixture of the two is necessary for complete success.

Gas Charges.

Many of you will have seen the Second Interim Report of the Gas Legislation Committee issued a few weeks ago. It is a very interesting document, foreshadowing some important changes in our methods of charging for gas. There are proposals for dealing with the unremunerative consumer, the stand-by consumer, the prepayment consumer, and the large-scale industrial user, which, if they become operative, will be far reaching in their effects. One satisfactory feature is that power will be given to make a minimum charge in cases where a very small quantity of gas or none at all is used. Provision is made for the regulation of dividends on a new basis which will remove the difficulty hitherto existing with regard to company undertakings. The new proposals if they become operative, should be helpful in developing large scale gas supplies.

The Gas Industry presents so many phases of activity that anyone entering it may be assured of a great variety of interests. Prevailing conditions to-day are such that we are prevented from keeping in a rut even if we wanted to.

What of the future? I am sufficiently an optimist to believe that the prospects for the future are bright provided that we make full use of our opportunities. There are certain directions in which we must not on any account relax our efforts. We must continue to strive after the greatest possible efficiency in manufacture and distribution and so bring down the cost of gas to the lowest possible figure. We must spend still more money on advertising and making the advantages of gas more widely known. We must not relax our efforts in the direction of technical investigation and research, which tend to improve efficiency and reduce costs.

We are engaged in a great industry affecting the lives of nearly the whole of the population of the British Isles. We have a highly efficient process at our command for converting raw coal into other forms of fuel, smokeless, convenient for use, and capable of adding to the comfort and well being of the community, saving labour in the factory and home and ready to hand at a moment's notice. Let us see that no effort be spared to improve our knowledge, and increase our efficiency, so that our Industry may advance with the times and continue to prosper as it has in the past.

Mr. F. H. Higton (Hon. Secretary of the London and Southern District Junior Gas Association) proposed a vote

of thanks to Mr. Kennedy for presiding, which was heartily accorded, Mr. KENNEDY briefly acknowledging.

Demonstrations of Gas-Driven Vehicles.

A demonstration of the two gas-driven vehicles at the Fair was specially arranged for the Junior Associations in the course of the afternoon, and the members were enabled to obtain some first-hand information and also judge for themselves the advantages of this rapidly developing means of propulsion by taking part in some trial runs in the vehicles along the roads adjoining the Fair Grounds.

The exhibit took the form of a complete compressing and filling station, from which the vehicles were supplied with gas during the whole period of the Fair. Included in these vehicles was a 32-passenger-carrying single-decker 'bus, which was fitted up with the necessary storage cylinders, reducing valves and air-gas mixing device, by the City of Birmingham Tramways and Omnibus Department in collaboration with the City of Birmingham Gas Department.

This follows as a natural sequence to the work which has already been carried out by the Birmingham Gas Department in connection with the application of gas for running other types of vehicles, but is of special interest, in so far as it is claimed to be the first public service vehicle operating on gas stored in alloy steel cylinders at very high pressures, which has been employed for the carrying of passengers under ordinary service conditions in this country.

Arrangements were made for this vehicle to take its place in the ordinary services, run between the Fair ground and the city, and it evoked considerable interest.

The particular vehicle referred to is fitted up with seven latest type alloy steel cylinders, manufactured by Messrs. Vickers-Armstrongs, Ltd., each having a free gas capacity of approximately 350 c.ft. at a working pressure of 3000 lbs. per sq. in. These storage cylinders supply the 6-cylinder engine, through a special 2-stage diaphragm reducing valve made by Messrs. Belliss & Morcom, Ltd., and an air/gas mixer manufactured by Messrs. Amal, Ltd., takes the place of the ordinary carburettor.

It is estimated that the storage capacity is sufficient to run the vehicles approximately 65 miles on a single charge under ordinary service conditions.

The filling station from which this vehicle will be supplied consists of a Belliss & Morcom 4-stage compressor, which is housed on the stand of Messrs. Belliss & Morcom at the Fair, this being electrically driven and supplying gas at 5000 lbs. per sq. in. into storage receivers placed at a convenient point near one of the main roadways encircling the Exhibition premises.

The storage containers referred to are five in number and are manufactured by the Chesterfield Tube Company, Ltd., each having a free gas capacity of approximately 1650 c.ft. at a working pressure of 5000 lbs. per sq. in., these five storage cylinders being connected in parallel and supplying vehicles at a working pressure of 3000 lbs. per sq. in., through special automatic charging valves manufactured by Messrs. Belliss & Morcom, Ltd.

Last week we mentioned that the Duke of York rode on a 'bus running on compressed gas at the British Industries Fair, Castle Bromwich. This was the Birmingham Corporation 'bus described above; and immediately following was a Chesterfield Corporation 'bus with various officials and members of the Press aboard. This 'bus also was inspected by the Juniors.

This 'bus also was running on compressed gas, having been fitted with a special reducing governor by the Bryan Donkin Company, Ltd., and special steel cylinders by the Chesterfield Tube Company, Ltd.

The charging stand of the Bryan Donkin Company is equipped with the firm's type of high-pressure compressor which is supplying gas compressed to 3000 lbs. per sq. in. to the cylinders on the Chesterfield 'bus.

GAS SALESMEN'S VISIT TO THE FAIR.

Mr. G. PHILIP ACHURCH (Chairman of the Building and Sites Sub-Committee) presided at a luncheon given to the delegates of the British Commercial Gas Salesmen's Circles who visited the Fair on Friday.

The CHAIRMAN read a letter of regret for absence from Mr. William Cash, the President of the British Commercial Gas Association, in which he said it was fitting they should meet at the British Industries Fair because the Fair itself was a concrete recognition of the national importance of selling. It was not too much to say that the future of the Gas Industry depended largely on the faith and enthusiasm of the selling force.

In proposing the toast of "The Gas Circles," the Chairman said their position, as he understood it, was not only primarily to develop the sale and use of gas, but what was of equal importance, to demonstrate to the manufacturers, the shop-keepers, and householders of this country, how to use that gas to the best advantage in the production of the maximum results at the minimum of cost. In this work they were supported by the researches of their various National Organizations in improvements in the methods of gas production and distribution; in the design and construction of appliances; and in the industrial sphere, in particular, in seeking new outlets and uses for gas for the constantly changing processes in the manufacture of goods.

It was to the great credit of an industry which had now rendered faithful service to the community for 120 years that, in all these matters, they had kept abreast of modern progress. The layman was apt to accept the availability of a supply of gas in his house in the same way as he accepted the supply of water, and without giving much thought to the work and organization which not only provided that service, but maintained it twenty-four hours in the day and 365 days in the year.

The great Gas Light and Coke Company of London had recently been advertising (with pardonable pride) that they "never let London down," and so far as his knowledge went that claim could be made with equal justification on behalf of the gas supply undertaking in every town in the Kingdom.

But as he visualized their work, it was their business to meet the consumer—both existing and potential—and to minister to the requirements of the latter. They were the spearheads of the selling force of the Gas Industry, and as such they held a position of major importance not only to their individual undertakings but to the Industry as a whole, because it was on their efforts, to a great extent, that the progress of the Industry depended. It was true they had competitors in fields of operation that perhaps years ago they were inclined to regard as peculiarly their own, but the salesman, imbued with a proper understanding of, and pride in, his work, welcomed competition as a spur to greater effort.

In responding, Mr. PHILIP H. CHRISTIAN (Chairman of the Lancashire Circle) remarked that it was the desire of every salesman who had the interest of his job at heart to make himself so efficient that he could place adequately before the consumers those pieces of apparatus which he felt confident would meet with approval and fulfil requirements. Where could they get that knowledge better than by attendance at this Fair, which was of such great magnitude. They appreciated very much in their various undertakings the opportunity of meeting there once a year and acquainting themselves with the achievements which had been made.

Mr. J. C. WALKER (General Secretary of the B.C.G.A.) expressed thanks to Mr. W. L. S. Spinks, who had succeeded Mr. Rogers as the Hon. Secretary of the Gas Section, for the work he had done in connection with the visit.

"Escol" Enamels.

"Escol" enamels, manufactured by Messrs. Jas. Gray & Sons, of 5, Victoria Street, S.W. 1, are the outcome of many years' experience and close study of the requirements of modern enamelling.

In the manufacture of all "Escol" leadless enamels only the highest quality selected ingredients are employed, and consistency is assured by strict laboratory control of every stage in preparation and manufacture. Scientific control ensures every batch being smelted to the correct temperature, and for the necessary period, to result in complete homogeneity. All "Escol" frits are mechanically screened and hand-picked for the removal of frit dust, large particles, and foreign matter, before being packed in special woven bags for safe transit. There is stated to be an "Escol" leadless enamel for every requirement.

The firm are exhibiting at the British Industries Fair, Birmingham, and their display includes samples of the ingredients employed in the manufacture of their enamels and a range of goods lent by various leading manufacturers in Great Britain who have adopted "Escol" enamels in place of foreign products.

They also show their "Olympia" mechanical vibrating sifter which insures precise sifting of all classes of enamel, together with a range of protective clothing devoted to the enamelling trade which gives one a glimpse of the thoroughness of the modern enamelling industry to ensure the comfort and hygienic working conditions of the employees engaged in the industry.

Testing of Gas Meters

The Question of Re-Verification

A meeting of representatives of Authorities of Great Britain administering the Sales of Gas Acts was held at the Manchester City Justices' Gas Meter Testing Station on Thursday, Feb. 16, Mr. H. N. BARROW, J.P., Chairman of the Manchester City Justices' Gas Meter Testing Committee, being in the chair.

Prior to the holding of the meeting an inspection was made of the Manchester Testing Station, and defects in a number of used gas meters which were exhibited were pointed out to the visitors. A principal cause for complaint was the occurrence of gas leakage without registration, thus involving loss to the supplying undertaking. Approximately, 80,000 meters a year are tested for accuracy at the Manchester Station.

Mr. A. WINTERBOTTOM (Chief Inspector of Gas Meters to the Manchester City Justices) explained that a Memorandum had been circulated by the Manchester City Justices Gas Meter Testing Committee to all authorities interested in the subject of the testing of gas meters. It was pointed out, in this Memorandum, with regard to the re-verification of gas meters, that the Manchester Committee had long felt the need of collaboration between their Committee and the different Authorities administering the Sales of Gas Acts. At the present time an important matter (the question of periodical re-verification of gas meters) was engaging the attention of the Board of Trade, and the Justices felt that a lead should be given in that direction by the Administering Authorities.

It would perhaps be helpful to consider briefly the law as it stood at present in relation to the stamping and subsequent examination of gas meters. The Gas Regulation Act, 1920 (section 13), required that "All meters by means of which gas is supplied by any undertaker to any consumer shall be stamped. . . ."

No provision had been made for the re-verification of meters, so that at present it was possible for a meter to remain on a district for as long as it would hold together without any further test, and still be considered a legal measure.

It was the view of the Association of Statutory Inspectors of Gas Meters that a meter, having received the official stamp or seal, conferring upon it the status of a "legal measure," should be subject to a definite period as such, and should, after the expiry of a fixed period, be deemed an unstamped meter, unless or until it had been re-verified and re-stamped.

The Association of Statutory Inspectors of Gas Meters had had the matter under consideration for some years. Meetings had been held between representatives of the Administering Authorities, the Institution of Gas Engineers, and the Association of Statutory Inspectors of Gas Meters.

At the last conference of these bodies, held in London on March 23, 1932, the Institution of Gas Engineers agreed to the principle of re-verification and put forward a basis of agreement.

The Institution approved the principle of re-verification of gas meters on the following basis, but was of opinion that the principle should not be applied until provision was made for the verification and re-verification of electricity meters:

> "The basis of re-verification should be that all meters which have not been verified (or re-verified) for over 20 years shall be verified within 5 years, and all meters which have not been verified (or re-verified) for over 15 years shall be re-verified within 10 years of the date of Regulations to this effect, and after such period of 10 years, all meters shall be re-verified within 15 years of their last verification or re-verification."

VIEWS OF THE MANCHESTER JUSTICES.

The Manchester Justices consider this basis to be unreasonable both in the number of years proposed for re-verification and the periods of time allowed for the change-over to take place, and while the Justices have every sympathy with the gas engineers as regards electricity meters, the question was irrelevant to the consideration of re-verification of gas meters.

In opening the proceedings of the Conference, the CHAIRMAN stated that it had been his privilege to attend every meeting which had been called of Statutory Inspectors held at various places.

As a result of their deliberations the Manchester City Justices' Gas Meter Testing Committee considered that 10 years was a reasonable period for re-verification of gas meters, and they suggested the following proposition for consideration and submission to the Board of Trade as a resolution:

> "All meters which have not been verified (or re-verified) for over 15 years shall be verified within 3 years and all meters which have not been verified (or re-verified) for over 10 years shall be re-verified within 5 years of the date of Regulations to this effect, and after such period of 5 years all meters shall be re-verified within 10 years of their last verification or re-verification."

Mr. WILLIAMS (Oldham) seconded the motion.

Alderman T. GLAISTER, J.P., (Bolton), said that the resolution stipulated that all meters which had not been verified or re-verified for fifteen years should be verified within three years' time. Bolton had about 55,000 meters in use, and he submitted that three years was a very short period to adopt. Would it not be better to make it five years, and then stipulate that there should be verification a certain number of years afterwards. Bolton had a station which was capable of dealing with about 300 meters a week, and it had to function for a very widely extended area, including Wigan. If every meter had to be brought in within three years' time the station would not be capable of dealing with the work involved.

The CHAIRMAN said that what was desired was to have the resolution passed, and then appoint a deputation to the Board of Trade in order to place the position clearly before the Government authorities. Possibly it would be necessary for the Government to appoint a Commission to inquire into the subject-matter of the resolution.

Councillor J. W. WILLOUGHBY, J.P. (Salford), said that the crux of the position appeared to be the difference between fifteen years as suggested by the Institution of Gas Engineers and the ten years suggested by the Manchester City Justices Gas Meter Testing Committee.

Mr. E. M. FOSTER (Exeter) remarked that he had been interested in the re-verification of gas meters for about 35 years. In his opinion, when a meter had been in use for seven years it was time it was sent in to be tested.

The CHAIRMAN mentioned that there were, approximately, 60 millions sterling paid for the supply of gas throughout the country, and that the only check upon the commodity delivered to the consumer was the gas meter, which, in many cases, was installed in positions most unsuitable for its accurate working. As a rule, a meter operated fast at the commencement of its career of usefulness and slower subsequently.

Alderman E. GIBBIN, J.P. (Newcastle-on-Tyne), said that if a meter was to be of any value at all it ought to give the purchaser of gas a correct record of the amount consumed. The present position was an anomaly when one considered that even petrol pumps had to be tested every year. Surely, it was equally necessary that gas meters should be tested with greater regularity. In his opinion, a period of ten years was reasonable. Even the makers of the instruments only gave a five years' guarantee for their products.

Mr. G. A. PICKERING (Inspector, Portsmouth) supported the motion, drawing attention to the fact that most gas consumers paid rentals for their meters, and that, in many cases, the cost of those instruments were reimbursed to the gas suppliers several times over in the course of a number of years. In all probability, at the end of five years the cost of the meter had been recovered, and therefore at the end of ten years there had been sufficient financial return to pay for the cost of its removal and testing.

The motion was then put to the meeting and carried by eight votes to one.

The Chairman and Alderman L. N. Ledingham (Sheffield) were appointed as a deputation to wait upon the Board of Trade and place the matter before them for their consideration.

The CHAIRMAN mentioned that according to a report submitted by the London County Council, under date May 20, 1930, 50 meters were removed from service and submitted to the Council's Finsbury Office for an exhaustive test. These meters were not suspected of inaccuracy either by the consumer or the gas company. Twenty-five of the meters were of eleven years' service and 25 of fifteen years' service and upwards. In the result, only one meter was found to be correct and stamped. The inference to be drawn would appear to be that the average meter, after extended service, was incorrect.

THE "JOURNAL" TECHNICAL RECORD

Which contains Reports of Meetings of Gas and Allied Associations

Distribution Practice at Croydon

Discussion on Mr. P. Richbell's Paper before the London and Southern District Junior Gas Association, Feb. 17—see "JOURNAL" for Feb. 22, 1933.

The PRESIDENT (Mr. A. Tennant, East Surrey), in opening the discussion, said he was sure they would all agree that they had listened to a most interesting paper, and Mr. Richbell had dealt with his subject in a very comprehensive manner. Mr. Tennant remarked that he had been associated with Mr. Richbell at Croydon for a number of years, and he therefore esteemed it a great privilege that Mr. Richbell should have read this paper during Mr. Tennant's year of office as President of the Association. The Croydon Gas Company could boast of being one of the most up-to-date companies in the country, and evidence had been shown them that night of the very thorough way they dealt with their distribution system. Mr. Tennant stated that his only experience of a trench-digging machine was when it had been used by a public works contractor—with consequent damage to their service pipes. He considered that these types of tools, together with thrust boring machines, were only used with a certain amount of risk. The Distribution Superintendent of the Redhill water undertaking had told him how a contractor, in using one of these machines for a sewer, dug up all the water services in a road on one Saturday afternoon. In using these machines they should be covered by an insurance company, and he inquired if Mr. Richbell covered himself with such a policy when using such machines. The remarks in the paper relative to Diesel oil machines were confirmed by the contractor who carried out most of his Company's main-laying work. This firm were spending thousands of pounds on Diesel oil machinery and were scrapping most of their other plant. The Diesel machines soon paid for themselves. Mr. Tennant referred to the occasions when he had borrowed Mr. Richbell's thrust boring machine, which had been particularly useful to them in laying pipes under roads.

Mr. Tennant thought that jointing was almost the most important part of main-laying, and the Croydon Company were carrying out pioneer work in utilizing lead wool joints; but he would like Mr. Richbell to say whether he considered such joints really better than the ordinary lead joints and whether he had had any trouble with the rubber rings. There were a good many new types of joint on the market at the moment, and he did not know which was the best to adopt. He looked forward to the day when a satisfactory joint would be brought out which would avoid any possible leakage from the main. Regarding steel mains, he asked how Mr. Richbell wrapped the joints on welded tubes. The wrapping of the joint was one of the most important things in laying steel mains, because, if the joints were not properly wrapped, the tubes were liable to rust, which constituted a weak point. He asked if Mr. Richbell used a bitumen mould or whether he favoured hessian wrapping coated with hot bitumen. Also, had he had any experience of a local council changing its mind after he had gone to the trouble of examining a main, and had he been called upon to carry out expensive reinstatement work? In laying long services, did Mr. Richbell advocate the use of meter boxes, or did he prefer to lay a long service and put the meter in a more satisfactory position? They had used meter boxes in his Company, and they found that the meter was apt to suffer in consequence. He asked if Mr. Richbell tapped the top or the side of a main when connecting-up a service. Mr. Tennant said that he had worked out the net cost of this work, and found that tapping on the top of the main cost 1s. 4½d., while ordinary side tapping cost only 9½d.

SERVICE CLEARING.

In clearing service pipes most of them were in the habit of using force pumps, with the result that they pumped the rust, liquor, and other things back into the main. Two or three years ago in Glasgow the Distribution Engineer had told him that there they had a similar machine to what Mr. Richbell used for pumping his syphons for extracting material from the services—instead of pumping it back into the main—and it seemed to him that this was the right method; he was rather surprised that such a machine was not more generally used. It would be interesting to know what the average cost of main-laying amounted to, and whether it did pay to lay one's own mains or was cheaper to employ a contractor. In conclusion, Mr. Tennant drew members' attention to the fact that they were visiting the sand-spun pipe plant at Staveley on March 8, and, after hearing this paper, it would be a most interesting visit.

Mr. H. J. ESCREET (Gas Light and Coke Company) congratulated Mr. Richbell on his most interesting paper. In reference to sand-spun pipes, he thought that the Gas Light and Coke Company were one of the undertakings who insisted on using class "C" pipes, the reason being that they felt that in these pipes they had an important type of material. Spun cast-iron pipes, he said, were stronger than the ordinary sand-cast pipes, and it was a question whether they accepted class "B" pipes which were thinner than the standard class "A." This made them much more liable to fracture. If one took the ordinary pipe, one was getting a pipe more the strength of the British Standard Specification pipe. It was a little cheaper, but there was really very little in it. He entirely agreed with what Mr. Tennant had said in regard to joints for steel mains—the wrapping was the weakest part. He had the opportunity of examining some of the mains in the Grays area, which had been laid some twenty years, and they were in perfectly good condition where the coating had not been displaced or the pipe chipped by picks. His Company were now using bitumen coating, while they were also experimenting with a combination of the two, running with bitumen and wrapping with hessian afterwards. They had not used trench digging equipment themselves, though their contractors had used these machines on one or two occasions. The difficulty with their use was to keep up with them, and they once had as many as twenty-three jointers at work in one gang. His first experience of a thrust boring machine was when they pushed it through the side of a 15-in. main. Again, he was always rather afraid that the services might be pushed out of line. He would also be interested to know, in the case of larger services, if the wrapping survived the thrust boring. He would be afraid that they would damage the wrapping and cause trouble in the future.

When using a trench-digging machine they tried a joint incorporating a rubber ring. They put in 1½ in. of yarn, 1 in. of lead wool, a rubber ring, two further rings of leaded yarn, finishing off with run lead. The placing of the lead wool in front of the joint had resulted in a tendency for the lead wool to work out at the front. They had cast lead in front of the socket, which made for a tighter job. Butt welding was better for the smaller types of pipe and sleeve welding for the larger sizes. He rather wondered why split T's and drilling machines were not used for the smaller sizes in Croydon. His Company now used these on jobs of 6 and 8 in. diameter. He thought that the question of additional depth was involved in the tapping of mains. A side connection gave an extra 10 in. depth; particularly was this important when running a connection across a roadway. A hole in the side of a main was less likely to weaken it than one at the top. He thought that the idea of using rubber plugs in the services was a very good one, for there was always a danger of waste being left in the pipe.

MASTER GOVERNORS.

Mr. Escreet said that he was not quite clear as to the reason for having a master governor on the boosting main. It was only at night time that it would be of any use, he thought, which raised the question as to the value of the air loading system—whether it was of any use in altering the pressure on the governor, and if so, what was the cost of sending a man round to do it. The Gas Light and Coke Company had adopted the Peebles clock loading apparatus, and they found this very satisfactory, enabling them to alter the pressure according to schedule every day. He would like to know whether Mr. Richbell found it necessary to alter the pressure on the station governor during cold weather. His Company had a system whereby they increased the pressure by ½ in. when the temperature went below 35° or 40° and by an extra 1 in. when it reached freezing point. They found that it was necessary to overhaul their governors once every three months—or six months at the outside—to keep them in good order.

Mr. RICHBELL, in reply, said that they did not take out an insurance policy at Croydon when using a trench digging machine; but when they started work in the vicinity of other public utility undertakings' plant they had one of the latter's responsible officers on the spot to tell them where their plant was situated, so that they could do their best to avoid it. They had been using rubber ring joints in Croydon for the past eighteen months, and they carried out a number of experiments before they finally adopted the system; so far as they could say at the moment, the method appeared to be

quite satisfactory. In regard to the rubber rings coming in contact with the gas, he thought they would appreciate from the form of the joint that the actual contact with the gas was practically negligible. As to the question of the quality of the rubber to be used, they had been having various tests carried out by the Rubber Research Association in Croydon with a view to finding a suitable composition for these rings, and they told him definitely that the less rubber they could put into the ring, compatible with making it elastic and reasonably tight, the better.

Pipe Wrapping.

In regard to the wrapping of steel mains, they had tried a bitumen mould, but he regretted to say they did not find this method very successful. They had not, perhaps, got the right mixture of materials. This he could not say, but the result was certainly very brittle, and a small blow was quite sufficient to disturb the bitumen and leave the steel main exposed. They had tried the use of bitumen and hessian wrapping, but if this was applied to the cold steel there was practically no adhesion to the actual tube, with the result that if moisture got behind the wrapping sweating took place, and corrosion was the natural outcome. They used a welder's blow-lamp to make the joint warm and arranged for the bitumen to be in small pots close to the joint, afterwards applying the hessian as quickly as possible and as hot as possible, so as to obtain similar conditions with the wrapping thus applied to the tubes to those when they were actually manufactured in the works. He had not experienced any trouble of the kind referred to in regard to local councils changing their minds after examination of mains. For one thing, they had from the various councils a monthly or yearly schedule for their work, and a certain amount of correspondence took place before they commenced their work, so that they took care that they were always on the "right side of the fence." Mr. Richbell considered that there was a great deal in what their President had said in regard to meter boxes—provided the services were not too long; it was better to bear additional cost of maintenance of service rather than fix a meter in a meter box where it would be subject to corrosion. His Company advocated a special type of meter box of concrete slab construction, with concrete slab roof, and requested that two reasonable sized ventilators were fixed on side of meter box to ensure that there was always a current of air passing through the box, thus decreasing the moisture which might settle on the meter. In regard to the prices of 1s. 4½d. and 9½d. for fixing bends and connectors, he was afraid that the question of side or top tapping was a very debatable point, and he thought that a considerable amount of useful time might be occupied in trying to arrive at some definite conclusions in this matter. One point he could bring in support of tapping at the top of the main was the fact that he had a record of the number of mains broken over the last twenty-five years, and during last year their actual fractures per mile of main were only 0·0625; he thought they would agree that this was a fairly low figure.

Referring to the matter of clearing services of liquor and rust, Mr. Richbell thought that there was something to be said for the particular machine mentioned by Mr. Tennant. Whenever they found liquor in a service they opened down on the services and remedied the trouble. Sometimes if the liquor in the service was very bad, and there was complete stoppage, it was necessary to carry out a temporary remedy, but they always opened the service and rectified the trouble. As to the cost of laying mains by contractors, he rather felt, from his own experience, that it was very much better to do the work with one's own men; he did not think there was much difference in the actual cost of the work. But his experience of mains which they knew had been laid by contractors a good many years ago was that his Company had had to go back and re-set the joints and remedy other minor troubles which certainly did not occur when the mains were laid by their own men. Referring to the President's last remark relative to the visit to Staveley, he could assure them that the plant was thoroughly well worth a visit, and he had been very interested when he was there eighteen months ago.

Class "C" Pipes.

Mr. Richbell said that he could appreciate Mr. Escreet's remarks, so far as he was concerned, in regard to the desirability of using class "C" pipes. There were two main reasons—first, that the surface for which he had to pay for reinstatement was no doubt very much heavier than theirs, and the small increased cost of the pipe was well worth while. In the second place, in a great many of the streets in which he had to lay mains there was considerably more disturbance of the sub-soil by other utility undertakings, and the bed of the pipe—which was one of the most important factors—was disturbed, with the result that the possibility of fracture of the pipe depended more on the actual strength of the pipe than was the case in a comparatively rural district such as Croydon. In regard to thrust boring machines and the possibility of the services being out of alignment, he agreed that this was a "snag." They had to overcome the difficulty of the pipes dipping in the middle, and to test for this possibility they poured a quantity of water into one end of the tube and made sure that the same quantity came out at the other end. If it did not they knew that something was wrong. He admitted that there was something in what Mr. Escreet had said in regard to the tearing of the wrapping when laying an 8-in. main under a railway, but in this particular case and in a number of other cases he had dealt with, the pipes had been laid in a good clean gravel sub-soil, where there was small chance of corrosion actually taking place. He would not think in any circumstances of laying a long length of pipe under a railway in a clay soil or in any place which might at some previous time have been a refuse heap, where the soil would be of an acid nature. Mr. Richbell said that he had thought of running lead on to the face of the socket, but the question had come into his mind as to the possibility of expansion of the joint, thus loosening the lead wool inserted by running hot lead on to the face of the socket. He inquired if Mr. Escreet had had any experience of this expansion of the joints.

Mr. Escreet replied that they had two rings of lead yarn in front of the rubber ring. The lead wool came in front of the rubber ring, and the two rings of lead yarn protected the ring from the hot lead.

Mr. Richbell, continuing, said that their master governor was only used for reducing the pressure at night. The difficulty would be when on some of these governors they had to work at 7 or 7½ in. pressure, and the pressure was maintained by being connected direct to the holder throwing something of that nature, and the actual governors situated at the works were reduced to 45-tenths, so that they had to put master governors in to throw the district governors out of action. He was glad to hear Mr. Escreet's remarks in regard to clock loading, in view of which he would certainly take steps to install one or two of these. As to altering the pressures on the district governors during cold weather, they had not any definite programme in this respect, but by virtue of their daily returns of pressures at crucial points on the district they were able to detect immediately any weakness, and at once take steps to remedy it. In regard to cleaning their district governors once a year, this was not, perhaps, a strictly accurate statement; when he said that they cleaned their governors once a year he meant absolutely dismantling them—that was, taking the air bell out and re-painting it, and so forth. But at least twice a year they took the covers off the governors and examined the inlet and outlet pressure pipes to make sure they were all working satisfactorily.

Pillar Boxes.

Mr. C. D. Stevens (South Suburban) asked if Mr. Richbell had experienced any difficulty in regard to the fixing of the pillar boxes on the pavement. He thought that the bend on the service tapped in the top would be a receptacle for dust, and he could hardly endorse what the President had said relative to drawing dust from the mains. He asked if there was any standard size for the hole in, say, a 4-in., 5-in., or 6-in. main. His Company had had quite a number of mains recently fractured of 4-in. size, and in nine cases out of ten they used a 1¼-in. hole for the services, and even this was rather large; they were endeavouring to have them not larger than 1 in. in the future. He inquired if the mains gangs at Croydon worked from one centre. Mr. Richbell had stated that half-turned and bored joints with lead wool in front were quite good. His Company found the full-turned bore the ideal.

Mr. J. H. Goldsmith (South Suburban) said that he noticed the lead-covered yarn was an oval shape; what was the object of this shape? He took it that it was desirable to lay the flat side in if possible, and he wondered if round lead-covered yarn would not be better. He would be interested to know if there were any tests applied before the mains were covered up; it was important to ensure that there was no possibility of an explosive mixture being left in the pipes. He asked what methods of sectionalizing the main was adopted when testing; did they put a valve in every so often and test from one valve to the next? They had tried to install Peebles governors on one part of his Company's area, but had to abandon the idea. They also tried putting clockwork mechanism in the pavement, but this did not last for more than a fortnight. The Peebles governor operated by an air-bell, mentioned in the paper, was interesting, but looked rather cumbersome. But it would surely be better to put down an auxiliary governor. In conclusion, Mr. Goldsmith asked if Mr. Richbell had had any experience of Peebles high-pressure governors.

Mr. F. C. Smith (Gas Light and Coke Company) inquired if the bitumen for applying over pipe wrapping, to which Mr. Richbell had referred, was bought to any particular specification as to penetration value of softening point. The wrong specification would lead to difficulty when running cast joint moulds. He inquired if Mr. Richbell had had any experience of laying pipes in concrete troughing. In certain areas it was very efficacious. From time to time, continued Mr. Smith, the Gas Light and Coke Company had a number of very ingenious devices submitted to them for detecting leakages; they had not adopted any of these, for they relied mainly on the Short's indicator and the palladium chloride method. He wondered if Mr. Richbell had found any of these more complicated pieces of apparatus worth while.

Double Bagging and Testing.

Mr. R. N. LeFevre (Gas Light and Coke) said that Mr. Richbell had referred to double bagging on all cut-out jobs. Did he use a gauge between the bags? He showed a gauge of the type they used for main-laying work on the district; but his experience was that gauges were usually very badly handled, and a simple single tube gauge without a scale, but just marked with the requisite test pressure, was all that was necessary. Mr. Richbell's highest district pressure was 40 in., and he tested at 70 in. of water column; yet with steel mains he tested at 90 lbs. per sq. in. Did he have a higher pressure in the steel mains, and, if not, why did he have a safety factor of 2 in the one case and 60 in the other? The question was, were they testing for mechanical strength or for soundness, and if only for soundness, he submitted that this factor of safety was somewhat high; and the all-important thing was not the pres-

sure they tested at but the rate of loss of pressure. They could test for soundness just as well with a comparatively low pressure, because they could use the mercury type of apparatus, and not the Bourdon type. *Locating* leaks was quite different to testing for soundness. He agreed as to the use of a label, but his Company used a lead label, which lasted longer and was less likely to corrode; the enamel plate was apt to become disfigured. Mr. Goldsmith had referred to testing in order to make sure that there was no gas left in mains which were stopped up with concrete. Mr. LeFevre inquired what Mr. Richbell did in the case of laying large mains in order to ensure that all the air had been expelled. In regard to testing services—which had been machine bored—for straightness, he suggested placing a light at one end and looking through the pipe to see if it was straight.

Mr. F. W. SIMS (Hampton Court) asked if Mr. Richbell was in favour of the use of sleeves for services across a reconstructed concrete road, whereby they could re-lay the services. Was it a good idea to sleeve with lengths of 3-in. wrought-iron pipe? If this were done it would be practicable to lay services with 1-in. pipe, and, if necessary, in the future, increase them to, say, 1½ in. This would, of course, only be necessary if there was not a main on each side of the roadway.

The PRESIDENT remarked that when concrete roads were being constructed his Company took the opportunity of putting down pipes in anticipation of supplies being required in the future, and they found this very useful. When supplies of gas were asked for all they had to do was to run the services through the pipes.

Mr. E. A. LAUNDY (South Metropolitan) asked if Mr. Richbell had had any experience of automatic station loading governors.

ADVANTAGES OF SIDE TAPPING.

Mr. G. WINSLOW (Gas Light and Coke) agreed that side tapping of mains certainly allowed greater cover for the services, if there was only one main in the road, on the opposite side. By the time one reached the other side of the road with a top tapping there was little more than 6 or 7 in. cover left for the pipe. He had found time after time that services had been much too shallow on the opposite side of the road to the main. He said he had a rooted objection to the use of thrust boring machines. Could Mr. Richbell always be certain that he was going to come out at the right place with one of these machines, and with the proper fall to the main? Many of the practices outlined in the paper, particularly those relating to office record work, were very fine. Mr. Winslow considered that the power rammer was one of the finest machines ever invented. If one used a power rammer one became friends with the local surveyors at once. He remarked that caulking tools were a very humane method of knocking up joints. In regard to stopping-up disused mains, Mr. Winslow questioned whether it was not better to put caps on them.

THE AUTHOR'S REPLY.

Mr. RICHBELL, replying to the discussion, said that they had a number of pillar boxes on the footpaths in Croydon, and they had taken the attitude under the Gas-Works Clauses Act, 1847, Section 6, they were entitled to erect appliances in the roadway conducive to the supply of gas.

They had adopted 1¼-in. tappings on vertically cast pipes and 1 in. on spun pipes for tapping a 4-in. main as the maximum size hole for this diameter main. He had not used the half-turned and bored pipes, but he had used a good many full-turned and bored, and they were fairly satisfactory, though he seemed to remember that they had to a have a number of split sockets so that when a joint became drawn they put on a split socket and ran it with lead to remedy escape. Mr. Goldsmith had inquired why they adopted oval-shaped lead-covered yarn instead of round. So far as this material was concerned, it was extruded through a press, and ideal condition would be rectangular section, so that it would lie properly in the socket; they had to get as close as possible to this ideal. In regard to the concreting-up of dead mains, they usually cut these at reasonable lengths and allowed them to aerate thoroughly for an hour or two before concreting-up the ends of the main.

The testing of mains when being laid rather depended upon the actual type of the main. They usually tested twice a week—on Wednesdays and Fridays—and they continued testing along the whole length until complete, then marrying-up at either end. The reason for testing on Friday was in order that they could leave the job fairly tidy over the week-end. He had not considered the matter of auxiliary governors in pillar boxes. There would be trouble, however, if the box got knocked over. They had had a Peebles high-pressure governor in use for three or four years, and it had proved thoroughly satisfactory throughout the period. In reply to Mr. Smith, he said that they had no specification for bitumen in Croydon. He did not quite follow Mr. Smith's remark relative to concrete troughing. Did he mean actually immersing the pipe in concrete?

Mr. SMITH: Yes.

Mr. RICHBELL said that he went into the question two or three years ago, and he had been informed that there was a tendency for the concrete to distintegrate, due to the different heat of the iron and the concrete. There was no elasticity at all so far as concrete was concerned, whereas with pitch filling there was a certain amount of elasticity, which seemed to be enough to prevent the troughing from cracking. They had not departed from the Short's indicator and a bar for testing for escapes except in areas where there were very high-tension electric cables, and in such cases they had on the top of the mains cards the words, "High-Tension Cables," which simply meant that rather than carry out any trials they had to get down to the place where there was a possibility of escape. Mr. LeFevre had referred to double bagging and filling-up with water between the two bags. They never did this, but rather relied on the practice on having someone with reasonable intelligence standing over the bags, and if there was a sign of any weakness they would give a shout in the right direction. There was a good deal in the suggestion of a single tube gauge, and he would certainly give the matter thought.

SAFETY FACTOR IN TESTING.

In regard to the safety factor of 2 in testing cast mains, as compared with 60 in the case of steel mains, they had found that the 70-in. gauge was much more sensitive so far as the cast-iron mains were concerned. But in the case of steel mains he rather felt that one wanted a fairly high pressure. There was a tendency to minute porosity on the welds, and it was only by the application of lubricating oil, which he mentioned in the paper, wiped round the joint that they could detect a leak—and even then it was some little time before any indication appeared. In regard to testing mains to ensure that all the air had been blown off, usually a stand-pipe with a cock on it was fixed at end of main and a bladder filled with the mixture. They then took it a safe distance away from the main and tested it. This method was quite efficacious. He also welcomed the suggestion of the light to see if the thrust bored service pipe was straight. The question had been raised by Mr. Sims of putting sleeves across concrete roads. He was not very keen on adopting this idea. For one thing if a service was laid through one for a number of years, there was a tendency for corrosion to take place more rapidly than if it was buried in the soil, and later a leakage might occur which would form a dangerous mixture in the tube, which might cause mischief.

Mr. Laundy had raised the question of automatic loading governors. Mr. Richbell said that he knew of these appliances, and understood they were satisfactory when used in comparatively level districts. If one had a district where there was a good deal of variation in the levels such as they had in the Croydon area, a certain amount of difficulty would be experienced.

In regard to paying for the reinstatement of trenches by local councils, the Croydon Company were on very friendly terms with all the councils in their area, and they were very reasonable, provided they did their work well in front of the reconstruction and also used power rammers when filling in their trenches.

VOTE OF THANKS.

Mr. H. C. SIMS (South Metropolitan), Senior Vice-President, proposed a hearty vote of thanks to Mr. Richbell for his paper, which was heartily accorded by acclamation, Mr. RICHBELL briefly acknowledging.

Midland Junior Gas Association.

Members of the Midland Junior Gas Association paid a visit to the British Cast Iron Research Association in Birmingham on Feb. 16. The visitors were received by Dr. A. L. Norbury, Mr. L. W. Bolton, and Mr. C. Rowley.

The British Cast Iron Research Association was established in 1921 in Birmingham as a national and Government-aided body for the purpose of facilitating research and development in the industries concerned with the manufacture of foundry pig iron and of castings in ferrous metals, particularly grey iron, white iron, and white heart and black heart malleable iron. Its field of work covers the raw materials of the industry such as pig iron and scrap, fuel and fluxes, materials used in the process of manufacture such as moulding sands, refractories, blackings, &c., and plant and equipment for melting, as well as the properties, structure, and composition of the product. The Association is supported by individual manufacturers in the industry who are enrolled as members and to whom the research reports and technical advice and services of the Association are available.

The first laboratory was acquired in 1924 and the laboratories and offices were combined in St. Paul's Square in 1926, and in July, 1932, extensions were opened by Lord Rutherford of Nelson. They include administration offices, library and information bureau, development laboratory for the application of current investigations to works practice, research laboratory for physical metallurgy, mechanical testing laboratory, and melting shop.

Developments made by the Association of particular interest to the Gas Industry relate to heat-resisting and, in some cases, corrosion-resisting irons now being manufactured commercially under the trade names "Silal" and "Nicrosilal."

At the conclusion of the visit the PRESIDENT OF THE ASSOCIATION (Mr. F. A. C. Pykett) offered a word of thanks on behalf of the visitors, to which Dr. NORBURY replied.

Aspects of Water Gas Manufacture*

By F. J. Dent, Ph.D.

For practical purposes the first reaction which occurs when air is blown through the fuel bed of a water gas generator is the gasification of the carbon of the coke with the production of the carbon dioxide. This reaction takes place with extreme rapidity at temperatures above 600°-700° C. and is accompanied by the evolution of considerable quantities of heat. When the oxygen has disappeared a second reaction occurs—viz., the reduction of the carbon dioxide formed to carbon monoxide, a reaction considerably slower than the primary reaction, but its rate increases with temperature. Consequently greater amounts of carbon monoxide are produced as blowing proceeds. The reduction of carbon dioxide to monoxide is endothermic and absorbs part of the heat liberated by the first reaction. It follows that during the blow period sensible heat will be generated with a minimum consumption of coke if the production of carbon monoxide is avoided.

The composition of the blow gases can be regulated by adjusting the relative amounts of air and steam, but the procedure is limited by two factors. As the proportion of steam is increased, the percentage of it which is decomposed decreases, and, further, the water gas made contains a higher percentage of carbon dioxide. Thus we find that in normal practice the blow gas contains considerable amounts of carbon monoxide—from 10 to 15% by volume. But all of this carbon monoxide cannot be regarded as loss, since some is required to maintain the temperature of the carburettor and superheater. However, on plants operating on cycles as long as 5 to 6 minutes the amount of carbon monoxide formed is more than meets this requirement, and it is usual for the waste gas at the outlet of the superheater to contain appreciable amounts of combustibles. If the plant is equipped with a waste-heat boiler some of the heat in the combustibles can be recovered as steam. The use of a waste-heat boiler in this way increases the overall efficiency of the plant, but it does not reduce the amount of coke supplied to the generator for the production of a given volume of water gas.

More economical conditions would be obtained if the potential heat of the carbon monoxide were recovered in such a way that it could be used in the gas-making reactions. Back-run steaming is a method of doing this. In the back-run process more of the potential heat of the blow gases is made available in the carburettor and superheater, and heat liberated there is used to superheat steam supplied to the generator. In this way part of the heat of the blow gases is returned to the generator, and the net effect on the efficiency of the plant is the same as if this heat had remained in the generator during the blow—it is the same as if the efficiency of blowing had been higher, and so the process leads to a decrease in the amount of coke consumed in the production of a given volume of gas.

31st Report of the Joint Research Committee.

The tests described in the 31st Report of the Joint Research Committee of the Institution of Gas Engineers and the University of Leeds were made to determine the extent of this advantage of back-run steaming. The investigation was made on a Humphreys & Glasgow carburetted water gas plant which included a generator equipped with a self-clinkering grate and annular boiler. The set was hand operated on a 5-minute cycle and comparative tests were made with and without back-run steaming under otherwise similar conditions. The result showed that the saving in coke resulting from the use of the back-run depended on the proportion of back-run steam used. When the proportion was increased until the limit imposed by the mechanical grate was reached, a saving in coke of 10% was obtained.

Output of Plant.

The tests also showed that back-run steaming led to an increase in the volume of gas made per day. An actual increase of 7% was obtained in the same test which gave the reduced coke consumption mentioned above. Owing to the heat returned to the fuel bed by the back-run steam a less amount of heat had to be generated during the blow, and as a result, when using the back-run, the blow occupied a shorter proportion of the total time leaving a longer time for steaming.

Efficiency of Oil Cracking.

It is a characteristic of the back-run process that a restriction is placed on the time available for the injection of oil, since carburetting is limited to the up-run. The higher rate will tend to give a lower efficiency of oil cracking, and its influence in this respect will be particularly marked when preparing gas of high calorific value. There is, however, another factor which enters into consideration, viz., the distribution of temperature throughout the carburettor and superheater. When using down steam without superheat difficulty was encountered in maintaining an adequate temperature at the top of the carburettor. The temperature at this point was low as a result of the heat absorbed by the vaporization of the oil, by the cool down-run blow gas entering from the base of the generator, and, also, owing to the supply of salivated steam to the top of the fuel bed, the gases leaving the outlet of the generator at the beginning of the blow were at a relatively low temperature. The difficulty was absent when using back-run steam, when the flow of steam in a reverse direction through the plant transferred heat from the superheater to the carburettor. The tests indicated that the resulting improved distribution of temperature when using the back-run would counterbalance the effect of an increased rate of oil injection when making gas of up to 460 to 470 B.Th.U. per c.ft. At still higher calorific values the back-run may show some disadvantage from the point of view of oil cracking. In order to minimize this loss of efficiency when making gas of high calorific value the period of oil injection should be spread out over the up-run as far as possible and a somewhat higher temperature used in the carburettor and superheater.

Distribution of Temperature in the Fuel Bed.

As stated previously, the reduction of carbon dioxide to carbon monoxide by hot carbon is a reaction which absorbs heat and which takes place at a rate which rapidly increases with temperature. It appears probable that, during the blow, the bulk of the carbon monoxide production occurs in a part of the fuel bed close to the combustion zone, since this zone is where heat is being developed and where the maximum temperatures are reached. For this reason it is suggested that, during the run, the amount of upward and downward steam should be proportioned so that in the succeeding blow the oxygen of the blast is consumed in a zone which initially is at a relatively low temperature. In this way the attainment of high local temperatures, and consequent formation of excessive quantities of carbon monoxide, is restricted. The temperature of the combustion zone can be controlled without influencing the average temperature throughout the fuel bed and hence without influencing the rate of steam decomposition during the run. In the tests of the 31st Report the temperatures in the combustion zone were lowered by increasing the proportion of the steam passed in a downward direction through the fuel bed, when the combustion zone was driven downwards, nearer to the cooler regions round the water sealed grate. Under such conditions a lower percentage of carbon monoxide was obtained in the blow gases. When less amounts of down-run steam were used the combustion zone moved upwards towards the middle of the fire, where more intense combustion occurred and where greater amounts of carbon monoxide were formed.

Inerts in Water Gas.

The amount of carbon dioxide in the make gas is one of the factors which determine the fixing of the operating cycle for the most efficient operation of the plant. In a general way it is found that the percentage of carbon dioxide in the water gas varies with the decomposition of the steam, the percentage of carbon dioxide increasing as the percentage of steam decomposed decreases. There is, however, no definite relationship between the two, and for a given steam decomposition the percentage of carbon dioxide varies with the distribution of temperature through the fuel bed; the percentage of carbon dioxide is lower when the fire is concentrated in the middle of the bed and higher when the heat is more evenly distributed—*i.e.*, when the bed is in the optimum condition for efficient blowing. However, within limits, it should not be attempted to maintain the carbon dioxide in the make gas at too low a figure. If an increase of 1% is permitted in the carbon dioxide content of the water gas it is probable that the percentage of carbon dioxide in the blow gas can be raised by 1·5% with an increase in the efficiency of blowing and a consequent saving in coke consumption of 2 lbs. per 1000 c.ft. of water gas.

If trouble is being encountered owing to a high percentage of inerts in the water gas, the first attention should be paid to the nitrogen content. Careful timing of the various valves on the plant in relationship to the rate of gas

* Paper given before the Yorkshire Junior Gas Association, Feb. 18, 1933.

production and the volume of free spaces in carburettor, superheater, &c., should reduce the nitrogen content of the gas to from 3 to 4% (nitrogen in air for purification not included). In this connection an observation in the 31st Report tests is of interest. When the temperature at the base of the generator was low, considerable amounts of steam condensed at that point at the beginning of the up-run. As a result, for a time, only small quantities of steam entered the fuel bed and the rate of gas production at the beginning of the run was low. Thus the carburettor and superheater were not swept clear of blow gas before the stack valve closed. Under such conditions the nitrogen content of the water gas was higher.

Automatic Plants.

In the discussion so far it has been assumed that the amount of carbon monoxide produced during the blow period is more than is required to maintain the carburettor and superheater at the desired temperature. This assumption is justifiable on plant operating on 5 or 6 minute cycles where the blow is of approximately 20 minutes duration, but it may not be applicable to sets automatically operated on shorter cycles. In the latter case it may be found that, when preparing gas of high calorific value, extra blowing time is necessary solely from the point of view of the cracking chambers. In operating such a plant care should be taken to burn the available carbon monoxide as efficiently as possible. In view of the foregoing remarks, in which it has been shown that the aim in blowing a water gas plant should be to produce a minimum amount of carbon monoxide in the blow gas above that required by the carburettor and superheater, it is suggested that more accurate control can be achieved by making periodic analyses of samples of blow and waste gases. It is believed that in many cases such a procedure would lead to a considerable increase in efficiency.

Discussion.

The President (Mr. J. W. Wood), in opening the discussion, said that those who had seen the reports of Dr. Parker and Dr. Dent realized what an immense number of figures were necessarily included in those documents for the purpose of adequately representing the results of the work done. At that meeting, however, Dr. Dent had skilfully avoided the figures and had given them the results of the tests in general terms. He had shown them the way to ascertain the economies obtainable by back-run and down-run steam. He would like to know from Dr. Dent whether the samples taken were uniform samples during the whole period of gas manufacture, whether blow or run.

Dr. Dent replied that they had carried out a prolonged investigation into that point, and had come to the conclusion that samples could be collected at a constant rate. That was fortunate, because it greatly eased the actual taking of the samples. The rates of formation of blue gas and blow gas were continually varying with the variations of temperatures of the bed, but those variations were not sufficient to give rise to errors which were not detectable in the gas in the apparatus. The thing to do was to design a plan by which the samples could be definitely taken at a constant rate throughout the individual blow or the individual run. With a completely automatic set that was all that was required, because the whole thing was continuous. One cycle was just like the next. With other types of plant, they did get periodic cycles, caused by clinkering or coking. Here it was necessary to see that the samples that were taken represented the whole of the periodic cycle.

Mr. F. Firth (Leeds) said that in the back-run process they took heat out of the superheater and carburettor and put it into the generator, and then the gas was passed straight on to the wash-box. In this way they were bound to be taking out a certain amount of heat which must be put back again for cracking purposes. In the other system the heat was not taken away, because the gas had to travel through a whole series of chambers, with the result that there was no such loss of heat as occurred in the back-run process. Dr. Parker made it clear in his report that no loss was incurred, but it would be most interesting to know why that was so. With regard to the increase of the CO_2 in the generators, he disagreed with Dr. Dent's present version. He much preferred to accept Dr. Dent's word picture as he gave it before the Institution—which suggested a partial de-oxidation of the gas prior to its entering the combustion bed. In regard to the comparison of the back-run system and the down-run system, the only difference so far as he could see was that the temperature at the bottom of the generator was greater with the back-run than with the down-run. Probably, he suggested, this accounted for the higher CO_2 content. With regard to Dr. Dent's reference to getting the highest efficiency with oil, one must recognize that the object to be aimed at was to produce the richest oil gas possible. On the one hand, they wanted complete cracking, but at the same time the temperature must not be too high.

Dr. Dent agreed that when back-run steam was used they would have to burn some of the carbon monoxide in order to keep the temperature in the carburettor and superheater. If they did not have to burn that extra amount of carbon monoxide they would have some extra combustible present which they could burn with tertiary air, and they could get steam from it in the boiler. They might use the heat in two ways, either for heating the back-run steam or for raising steam in the boiler. Which was the better method of using it? He did not think there was any room for doubt that the back-run method was the better of the two. If they were to use the carbon monoxide to superheat the back-run steam it would be equivalent to taking that heat back into the generator, and they would be actually reducing the amount of coke that they had to supply to the generator for the production of a good volume of gas. If they let it go forward, all that they did was to get it back as steam. In actual practice the heat unit of steam had nothing like the value of the heat unit of gas, and it was there where the back-run method of steaming scored. Mr. Firth had also raised the point as to whether the cooling of the combustion zone was sufficient in itself to account for the difference of carbon monoxide as between the two experiments. He thought that probably that would be so, if they took into account also the factor which Mr. Firth had brought up as to the effect of the ash. He thought that a relatively small difference in temperature would be sufficient to interfere with the reduction of carbon dioxide to carbon monoxide to reduce it within the limits suggested. The reduction of carbon dioxide increased very rapidly with temperature. Then Mr. Firth had brought in the effect of the ash and suggested that he (the lecturer) had not told quite the same tale as before on that point. If there was any seeming difference of statement on his part, he did not think it was due to any change of his mind about the effect of the ash, but it was just a question of simplifying things a bit. Dr. Dent said that his colleague and himself, in their reports, had always judged the efficiency of oil cracking on therms per gallon, but he was inclined favourably to Mr. Firth's view, and had been thinking out the matter on similar lines. He had not yet been able to obtain sufficient data to enable him to form a definite conclusion, but he intended to test the matter fully.

Mr. Firth said his contention was that the total thermal yield was better if they produced a rich gas.

Dr. Dent said that they had never over-cracked oil to such an extent that the thermal yield had gone down.

At the conclusion of the discussion, Mr. Firth proposed a vote of thanks to Dr. Dent.

Mr. A. W. Elliott (Elland) seconded the resolution.

The President said he would like to add his personal thanks to Dr. Dent for the ready way in which he had acceded to the request that he should assist the Association by reading a paper during the year of his (Mr. Wood's) Presidency.

Dr. Dent said he had enjoyed the occasion very much, and if he had stimulated their interest in water gas plant at all the visit would have been well worth while to him.

Upon the motion of Mr. J. W. Holroyd (Rotherham), seconded by Mr. J. Holmes (Pudsey), a vote of thanks was accorded Mr. E. Crowther, the Bradford Gas Engineer, and the Bradford Corporation, for permitting the use of the room.

Heat Insulation*

By A. Lindsay Foster, M I.Mech.E.

When considering the wide range of materials which serve as " insulation " it is noticeable that each is restricted as to the temperature for which it is suitable, and not on account of its conductivity-properties but by reason of the fusibility or decomposition of the materials, and, unfortunately, as the temperature rises, with increasing need for heat conservation, the conductivity of available materials increases until we find that the refractory material with relatively high conductivity often has to stand alone, which has been the condition of the open-hearth steel furnace arch and may still continue to be so pending further development.

While the insulation of high-temperature furnaces presents certain difficulties, their nature is not always clearly appreciated. This was aptly illustrated in a recent discussion when prominence was given to the fear that if a furnace-wall or crown were insulated the furnace-wall would be melted.

Furnaces of any importance are subject to control as to the temperature at which they work, and it may be taken that, unless for exceptional cases, the temperature of any particular furnace is kept within specified limits and that if insulation be added to a given thickness of wall less heat will pass outwards, but the supply of heat will be reduced so as to keep the desired temperature in the furnace.

The temperature gradient through the refractories will

* From a paper before the Institute of Fuel, Feb. 8, 1933.

be altered so that their outer faces will be hotter than before. The hot layer exposed to the flame, which may be regarded as being approximately at furnace temperature, will be thicker, and that may affect the rate of erosion at the surface, which, of course, depends upon the velocity of the gases and other conditions in the furnace.

When considering a refractory backed by insulation, it is necessary to bear in mind that the brickwork of the arch will not only be at a higher average temperature, but there is always the possibility of leakage of heat through joints, which means that any material used as insulation must be such that, particularly on an arch, it shall not have any action on the refractory.

An example is a first-class silica brick, which was backed by a brick containing fireclay. The fireclay was attacked by leakage through a joint and fluxed the silica matrix, leaving a honeycomb of silica grog. There is less risk at vertical surfaces, even at high temperatures, as an insulating brick, if damaged, cannot attack the refractory in the same way.

When one passes from high temperatures to the relatively low temperatures at ports, regenerators, flues, &c., there is plenty of scope for insulation and little difficulty in achieving useful gains, but it is important to watch for what may be termed the lower limit of the usefulness, so that money is not wasted on conserving heat which cannot be recovered and will pass away in the chimney gases.

When waste-heat boilers are in use it is important to insulate the flues, and, if it can be done safely, the reversing valves, since the efficiency of the boiler depends upon the temperature of the gases with which it is supplied.

If, on the other hand, the possible use of a waste-heat boiler is being considered, it is important to investigate the heat losses at the flues and the lower parts of the regenerators, as it is likely that by insulating these the temperature available in the chimney gases may be appreciably raised.

Insulation about furnaces is, however, useful in preventing the spread of heat to working floors and spaces where it may be very detrimental to the comfort and efficiency of the individual.

Over the range of temperatures from about 1000° C. downwards there is a fair range of choice in insulations, but limits of refractoriness again regulate our choice and it is necessary to grade the structure of the wall; the more so as heating in this range and on smaller units is often carried out by means of fuels costing about threepence per therm or more when temperatures have to be reasonably uniform or closely regulated.

The choice among insulating methods extends beyond that of the material to the form in which it is applied, and to-day there are industrial furnaces insulated with mattresses, which for some work are very suitable, in that they can be quickly removed and replaced, and, if made of a suitable material with long fibre, will retain their form and efficiency in work of this class.

It is very usual to consider saving some of the heat which is being supplied to any apparatus or process; but there is a very valuable application of insulation in annealing or heat-treatment, where the material and attendant apparatus are already heated and the problem is to retain the heat. Here the economy offered is that of doing away with any further supply of heat, with resulting reduction in running cost and first cost of the plant, and greater simplicity and in these cases one finds it economic to spend more on insulation at a given temperature than in the more usual circumstances.

An early and successful approximation to the realization of this ideal was the annealing of optical glass, carried out about 1905, the solution of which problem depended almost entirely upon the use of insulation, the type of apparatus used remaining virtually unaltered to-day.

The practice of heat insulation for steam plant remained more or less static for many years after the introduction and acceptance of magnesia, which established itself on its known composition and which, when unadulterated and properly applied, gives a large measure of assurance as to its non-conducting properties in use.

The mixture of 85% magnesium carbonate and 15% asbestos became, and was for many years, virtually a standard of performance in heat insulation among various forms of asbestos and a range of compositions; many of the latter, however, were relatively valueless and should have disappeared from the practice of insulation.

Many so-called insulating materials are of unspecified composition, and, while specimens may be subjected to test for heat transmission, the composition of the bulk as applied in practice is liable to variations in the course of making-up and applying, which it is difficult and even impossible to check.

There has been no instrument available to test the amount of heat conducted through insulation *in situ*, and though efficiencies or rates of heat loss have been, and are, specified, they could not be readily checked on the job.

Despite the amount of attention which has been given to developing good insulating materials, there are still those who are prepared to pay for unspecified " compositions " or " common lagging " of which the performance is unknown or is, at least, conjectural, their one claim being " cheapness." The fallacy underlying their use is that the labour in their application is substantially the same as that of a first-class and reliable material, and the total cost for equal insulation, if or when that may be possible, would even be greater than a first-class material.

It is quite possible by the application of inferior insulating material to increase, rather than reduce, the heat losses. This, of course, only occurs in the case of small pipes covered with very poor material. The heat losses reach a maximum when the outside diameter (d in ft.) of the insulation is equal to twice the co-efficient of heat transfer by radiation and convection of the insulated pipe.

On the general adoption of superheated steam the practice of insulation entered on a new phase, as the materials which had served on boilers and pipes with saturated steam at temperatures up to about 350° F. or even 400° F. were unsuitable.

With superheat came not only the temperature but the attendant expansion problems, and whereas the expansion of a 10-ft. length of steel is about $\frac{7}{16}$ in., from 60° F. to 380° F., the corresponding figure when carried to 800° F. is about $\frac{3}{4}$ in., and insulation which could stand up at the lower temperatures were found to come loose due to decomposition or disintegration combined with lack of resilience and, perhaps, vibration.

Negligible Expansion.

Materials used as insulation have negligible expansion under heat and, if applied as plastic, can only follow the extension of the heated metal by loosening the hold on the metal or separating into small units divided by tiny fissures.

Those applied without adhesion must allow the pipe to slide within them, or, if resilient, like Glass Silk, follow the surface on which they are mounted. Alfol is another material which is undisturbed by expansion and contraction. During recent years new forms of insulation have been developed to meet the conditions of superheated steam at temperatures above that at which magnesium carbonate decomposes, resulting in greater diversity than ever in insulating practice, so that the engineer is confronted with a rather complex problem when specifying, and many specifications which have become standardized in years past have needed revision.

Both Glass Silk and Alfol employ materials which are new in the field of insulation. Both of them are inorganic and each includes reflection as an active property, Alfol conspicuously so and Glass Silk in a measure.

Everyone is familiar with the reflecting power of bright metals, including aluminium, and that is the property largely used in Alfol insulation; while Glass Silk also has the property of reflection, though in a less degree, the surfaces of the glass filaments being drawn from the molten bead without any contact until perfectly hard, so the " fire-polish " (which is the glory of the old English Crown glass) is preserved on each fibre.

Aluminium is known for its ability to preserve a bright surface, while Glass Silk, being pure glass, has all the permanence associated with the surfaces of our windows.

Both these new materials are suitable for direct application to surfaces up to about 1000° F., and thus it will be seen that each of these newcomers has individuality, and they share certain physical properties in common, both aiming at good and permanent insulation at the higher steam temperatures.

At this stage it is necessary to consider each separately, as, while they have some properties in common, they are otherwise very different.

In " Alfol " one has a very light material, the actual aluminium foil weighing about 3 oz. per c.ft., which is enclosed by a self-supporting protecting shell.

The fundamental form of the insulation is parallel or concentric sheets, which Dr. Schmidt found in his original investigations gave their best effect when spaced at about $\frac{3}{8}$ in.; but, as this is not a convenient form in many applications, the more usual method is to crumple the foil lightly and place in position in layers inside the casing, the number of layers depending upon the insulation thickness and the degree of insulation required.

It will be seen from the above that the insulation operates by combining the low conductivity of the air spaces between the layers with the heat reflecting power of the bright metal surfaces formed by each layer, thus reducing loss by convection and radiation. Conduction loss, owing to the thinness of the foil and to the fact that the layers touch only at intervals, is said to be negligible.

In addition to its light weight the following features may be mentioned: Cleanliness, non-inflammability, and low heat storage capacity.

Glass Silk.

"Glass Silk" was first developed as heat insulation in Germany, where it has been extensively used for some years in marine work and on land, and the manufacture by electric spinning was introduced into this country about two years ago.

The material has distinctive physical properties, being chemically glass, but, when made up for use, it develops new attributes, which are characteristic of its form. Besides being a first-class insulation, it has remarkable resilience, and the fibres are very strong, a workshop test showing an average tensile strength equivalent to 30,000 to 35,000 lbs. per sq. in.

The fibres adhere to one another with some tenacity due to the high coefficient of friction between dry glass surfaces and the entanglement that ensues on assembly of the mat. This property causes mattresses of Glass Silk to keep their shape and stand a lot of knocking about without the thickness being affected. The resilience of the material gives it power to resist damage in handling and after being fixed, and it is really almost difficult to damage it.

It is applied in the form of sheets, strips and sectional mats, and may be covered with any of the usual finishes.

The writer is developing a workshop form of calorimeter for determining the heat loss from insulation when in place.

If the measurement of temperatures of surfaces were easily done with accuracy, and if emissivity effects did not exist, the problem would be easy of solution, but there are difficulties in taking surface temperatures, and various devices have been developed for simplifying the process, but none are readily applicable to insulation in most of its various forms.

Emissivity effects have been often written about, but latterly their importance and quantitative treatment have been thoroughly dealt with by a report from the National Physical Laboratory.

It will be seen that for practical purposes the range of emissivities may be said to extend from such surfaces as canvas to glossy finish on a fine plaster; though one might encounter a special case where the surface is finished with metallic paint or bright metal, and in testing the validity of the method now to be described aluminium foil is being applied to represent the extreme case of low emissivity.

The problem is to find a means sensitive to the rate of heat loss, but which shall not be affected by the emissivity conditions, at the outer surface of the insulation. Further, whatever means are used must not have any appreciable effect on the conductivity, either radially or laterally, at the place of application.

In the method adopted by the writer, a resistance-wire is embedded between two layers of very thin doped fabric which forms a bandage or plaster for application to the surface to be tested.

The fabric is doped to exclude moisture and ensure constancy of emissivity at the surface of the bandage. When this is applied the emissivity of the bandage is substituted for that of the surface on the insulation, and the insulating effect of the thin doped material can be ascertained and allowed for, but in practice is negligible.

The wire is of platinum and its resistance can be measured by any convenient means, using, of course, the null method, and the heat loss per unit area at the insulation surface is obtained by calibration against the resistance of the platinum wire.

When applying the bandage to a pipe it is simply laid around and drawn tight, and if the pipe is small the bandage is laid in a spiral; it must not overlap, or, of course, enclose air-pockets.

For very large surfaces to which the bandage cannot be applied, the resistance element is made up as a "plaster" fixed by a semi-adhesive which, at heats found on insulation, will not evaporate or dry-up.

To test heat losses on an insulated pipe line readings should be taken at points selected as representative of the conditions and, simultaneously with the readings on the instrument, the temperature(s) of the air in the neighbourhood should be taken.

The investigations up to the present have been devoted to testing the validity of the method, and the details of design and calibration are now being considered.

It is desirable to point out that the apparatus itself does not take account of external conditions, such, for example, as rapid air currents over the surface of the insulation, but it promises to apply to a large proportion of the work which is met with in the practice of heat insulation and in a way for which no means have been readily available hitherto.

Register of Patents

Flueless Radiators.—No. 380,917.

Cannon Iron Foundries, Ltd., and Clayton, R. T., both of Deepfields, Staffs.

No. 23,683; Aug. 24, 1931.

The invention refers to gas radiators of the column type in which an upward passage is provided for the products of combustion from a burner at the base of the column leading to the upper part of the column where a free communication is made to a down passage in the other side of the column, from which eventually the products of combustion are released to the atmosphere.

The invention consists in arranging in the upper part of such a column type gas radiator a boiling burner which is enclosed by a cover forming the top of the radiator column. This burner has a support plate for the articles to be placed upon it, arranged so as to seal the top of the column against the outlet of the products of combustion.

Gas Cocks.—No. 381,468.

Ewart, S., of Euston Road, N.W. 1.

No. 7094; March 9, 1932.

This invention has for its object to provide a simple device by which adjustment of the effective passage area of a gas cock can be made and which is normally sealed so that the adjustable device is not readily accessible to unauthorized persons. There is provided a gas cock of which the effective passage area is variable by means of a screw which is screwed into a hole formed in the cock, the screw being adjustable axially so as to extend more or less into the passage of the cock, and wherein a sealing device is arranged to close the hole above the screw.

Adjustable Lamp Reflectors.—No. 385,435.

Parkinson & Cowan (Gas Meters), Ltd., and Hobson, H. A., both of Birmingham.

No. 387; Jan. 6, 1932.

This invention relates particularly to the adjustable reflectors used in street lamps, but may be applied to reflectors for other lamps. The object is to provide an improved adjustable mounting which enables the reflector to be removed at any time for cleaning without disturbing the adjustment.

The invention comprises the combination of a fixed support, a reflector carrier attached to the support and adjustable thereon about a fixed vertical or other axis, means on the carrier for effecting a detachable pivotal connection with the reflector, and an adjustable abutment on the carrier against which the reflector can rest.

Parliamentary Intelligence.

[From Our Special Correspondents.]

House of Lords.

Private Bills.

No further proceedings since last week.

Special Orders.

The following Lords have been appointed a Select Committee to consider the Watford and St. Albans Gas Order, 1932: The Marquess Camden, Viscount Bertie of Thame, Lord Monteagle, Lord Fermanagh, and Lord Mount Temple (Chairman). They are meeting at 11 a.m. to-day.

A Special Order proposed by the Swindon United Gas Company has been laid before the House and referred to the Special Orders Committee.

House of Commons.

Private Bills.

The Gas Light and Coke Company Bill and the Commercial Gas Bill have been committed.

The petition of the Finsbury Corporation against the Gas Light and Coke Company Bill has been withdrawn.

Special Orders.

A Special Order proposed by the Swindon United Gas Company has been presented and ordered to lie on the Table of the House.

Plans have been deposited in connection with the Coatbridge Gas Order.

Tottenham and District Gas Company

ANNUAL GENERAL MEETING

The Annual Ordinary General Meeting of the Proprietors of the Tottenham and District Gas Company was held on Feb. 21, 1933, at the Chief Office of the Company, Woodall House, 658, Lordship Lane, Wood Green, N. 22—Mr. HENRY WOODALL, M.Inst.C.E. (Chairman and Managing Director), presiding.

The SECRETARY (Mr. Edward J. K. Fussell) read the notice convening the meeting, after which the common seal was affixed to the register of proprietors.

The Chairman's Address.

The CHAIRMAN said: I presume you will take the report and accounts as read. [Agreed.]

You, Ladies and Gentlemen, will I think have been satisfied with the report we were able to send you. In these times of trade depression and serious unemployment, your Directors are very thankful that our business has continued to progress, and that we are able to keep our works and workmen fully employed.

We are fortunate in having a small increase in the sale of gas of almost exactly 1%. It is true we have a wonderfully good district of supply, but an increase in these days shows that those responsible for keeping up our sales are not only well qualified, but they are keen and energetic.

One point I should like to emphasize is the way we have kept and extended the use of gas for public lighting. We are fortunate in having over 90% of the public lighting over our large area of more than 100 square miles. Last year we had an increase in our public lighting of 4·40%, and this year we have again an increase of 3·3%. This does not take into account lamps in the new districts—if these were added the increase would be 9·2%. The total number of lamps in the whole district is 8897; last year the number was 8629, an increase in the year of 268.

There is no doubt gas is superior to electricity for public lighting; the light is better diffused, and this is particularly noticeable in foggy weather, and, further, it is more reliable. I do not wish to be unfair to our electrical competitors, but they do have failures in supply which are practically unknown with gas.

Another feature of our business which has given satisfaction is the growth of our industrial load. Under this head our output increased by nearly 10% in 1932, and is still increasing. This is a day load—a load we want—and opens out a very large field. Naturally, to obtain it we need a good technical staff and a suitable charge for gas to meet the severe competition of oil and electricity.

HERTFORD, HODDESDON, AND WARE.

Last year I told you that we expected an Order authorizing the amalgamation of these Undertakings. The Tottenham and District Gas Order, 1932, has received the Royal Assent, and the above-mentioned districts as from Jan. 1, 1932, were included in our area of supply. The Hoddesdon and Ware Works are no longer in use, Hoddesdon being supplied from our Ponders End Works, and Ware from our Hertford Works. Economies have been effected by this linking up, but the growth of the Company's business has made it possible, to our great satisfaction, to absorb the whole of the permanent servants of the Companies taken over. I am glad, also, to state that the price of gas has been reduced in all the three areas.

WOOD GREEN ELECTRICITY.

You, Ladies and Gentlemen, will share with your Directors, regret at having to part with this very successful branch of our Undertaking. Since the beginning of this year the Wood Green electricity supply has been in the hands of the North Metropolitan Electric Power Supply Company. Very shortly the story is as follows:

In 1902 the Wood Green Urban District Council obtained an Electric Lighting Order. Two abortive attempts were made by the Urban District Council to set up an Undertaking of their own. This Company then, rather than the district should be without what they wanted, came to the rescue, and took over the Order, and have worked it ever since, obtaining thereby both merit and pecuniary advantage. The Urban District Council, however, retained the right of re-entry on giving one year's notice after 1928. The consideration money, if it was decided to exercise the option of re-purchasing, was the capital value *plus* 20%, decreasing at the rate of 1% each year the notice was delayed. We tried to get an extension of our Order, but the Urban District Council declined to give it, and entered into negotiation with the North Metropolitan Company, and in the end our rivals obtained possession.

At the commencement of the supply we made no profit in Wood Green, but for the last few years, as you have noticed, the profit has been a very handsome one, and the amount we have received for our Electricity Undertaking, though carrying a large premium, cannot be invested to bring in anything like the income we have recently enjoyed.

I should like to say that our negotiations throughout with the North Metropolitan Company were of a most friendly nature.

WALTHAM AREA.

You may perhaps remember that when we took over the Waltham Gas Company a differential price was fixed in the Waltham area. We, at the time, asked that the differential should be permissive, but at the request of the Middlesex County Council and the other Authorities concerned, "shall" and not "may" was the word used. Now, as the result of further action by this Company, the differential is gradually to disappear over a period of seven years and the consumers in the Waltham area will receive a reduction in the price of gas of 3d. per 1000 c.ft. per annum until such time as the price is the same as in the Tottenham area. The cost of this reduction will be, in round figures, £1500 per annum for each reduction of 3d. per 1000 c.ft. It is, however, hoped and expected that the reduction in price will bring its reward in increased sales. I am satisfied you will agree with your Directors that a permanent differential price in any part of our area is undesirable.

FINANCIAL RESUULTS.

I will now turn to the accounts. £109,835 of 5½% preference stock has been issued to the Shareholders in the Hertford, Hoddesdon, and Ware Companies, and we have been given power to issue the unissued capital of the Hertford Company, the authorized capital of this Company being thereby increased by £11,699. Statement "B" shows that we have replaced £98,695 of 7½% redeemable debentures by the same amount of 5½% preference stock.

The capital expended during the year was £55,607; but from this we have deducted for depreciation and obsolete plant £52,777, so the net capital outlay for the year, apart from the purchase price of the three Undertakings, only amounts to £2830.

You know how carefully we watch the capital expenditure per million c.ft. sold. This has been going down from year to year, and last year stood at £449. This year it is £454 per million c.ft. sold, which, although an increase, is a very small one when it is realized we have taken over three Undertakings with a relatively high capital.

I will not go through the figures of the Electricity Undertaking, as I have before explained it is no longer our property.

It will be noticed in the revenue account that the charge for repairs and maintenance of works is down by £28,605. The main cause of this is that in 1931 we carried £25,000 to a suspense account in connection with the installation of intermittent vertical retorts to take the place of less efficient and partly worn out plant, whereas this year we have only carried £10,000 to this account. On the other hand, there has been an increase in the cost of repairs and maintenance of mains of £24,102, owing largely to the connecting up to Hoddesdon and Ware which I mentioned before.

CO-PARTNERSHIP.

Co-partnership, which all the workers in the three amalgamated Companies now enjoy, has cost a little more, also pension and superannuation funds—payments we do not grudge. Under the Health and Unemployment Acts there is an increased charge of nearly £1000—a figure over which we have no control.

I would like here to say that our reserves are very carefully invested, and we have specially to thank the Deputy-Chairman, Mr. Bailey, and the Finance Committee. The market value of our various reserves on Dec. 31, 1932, was £415,541 3s. 3d., whereas the cost was only £377,332 13s. 3d.—an appreciation of £38,208 10s.

Net coal has cost us a little less, partly owing to better working and partly to a higher return from residuals.

We have recently installed a benzole plant which has made a good profit. The plant is now being extended, and the benzole is to be refined, and the profits will, in consequence, be considerably increased. The profit helps us with the loss, though a smaller one than last year, which we made on sulphate of ammonia.

The result of the year's working is that after paying special charges for compensation and depreciation of War Loan, of over £30,000, adding £7000 to our reserves, and paying the full statutory dividends, we are able to carry forward £55,569—an increase of £1129. I hope, Ladies and Gentlemen, you will regard this as a satisfactory result.

GAS FOR MOTOR VEHICLES.

There are one or two other matters I will just refer to. Last year I told you we were experimenting with gas for motor vehicles. We had the first lorry in this country at work running on gas at high pressure, and it has run intermittently since then, and we have been able to carry out a number of experiments and gain useful information, and we are not without hope of extending in this direction. Since, however, we have manufactured benzole we find it more economical to use this—also our own product—in our motor vehicles, rather than gas.

During the year we have fixed a very large number of new appliances. This increase is not fairly represented by the in-

crease in gas sales, due partly no doubt to the new appliances being more efficient than the old ones.

Allotments for the Unemployed.

Having seen some little time ago in " The Times " an article on the work of the Society of Friends in connection with this movement, I brought the matter before the Board, who were unanimous in their wish to do anything they could in the matter. We have some spare land which is not likely to be required for some years, and we have been able to set aside at Tottenham nearly 6 acres, at Enfield 2 acres, and at Waltham Cross 5 acres. The total number of allotments available will be 170, and I am confident you will agree to the small expenditure necessary to fence and clear the land being borne by the Company. [Hear, hear.] Applications are being continually received for permission to use the allotments, and it is anticipated that before long they will all be under cultivation.

There has been a good deal of discussion as to the powers of charge of gas companies and the relative freedom of our competitor, the electrician. Gas legislation to remedy some of our grievances is being introduced and will no doubt be carried through.

Coal.

Finally, one word about coal. We all know that it is of great importance to this country that the coal industry should flourish. Is the present policy of artificial price and quotas for the good of the coal industry? I think not. What we surely need is that the efficient collieries should be encouraged as they deserve to be, rather than hindered, in order that less efficient collieries should be able to exist. Some of my colliery friends tell me that had they freedom to work their collieries to the full they could considerably reduce costs and price. It might be possible to copy to some extent the method by which redundant public houses are dealt with, by means of a Compensation Levy. In any case, if we are to keep and increase our home and export trade we must encourage efficiency.

The history of coal mines abroad, where output has recently increased to a remarkable extent, due to the adoption of every modern method, proves that we cannot afford as a nation to put difficulties in the way of our progressive collieries.

We, at Tottenham, do not seriously complain of the present price and quality of our coal. Much has been done to improve the quality by scientific screening and washing, and we now purchase all our coal on terms of ash and water content. We have, however, very severe competition and shall appreciate any further improvement in price and quality.

We now find the use of oil fuel is cutting into our business seriously, and this means the use of less coal.

It is not likely that for ever the use of raw coal and its resultant smoke will be tolerated. Coal should not be used in its raw state, but distilled into gas and valuable bye-products.

There is in this country a natural desire to have an open fire, and for the good of the community it should be a smokeless one. This Company have for some time past been experimenting with the carbonization of its coals with the object of producing a satisfactory fuel for domestic purposes. We have now produced an ideal domestic fuel which is very properly described as high-temperature gas coke. Suitable coke stoves have also been designed in which to use it. These stoves have a gas burner as part of the equipment; the coke is lighted by gas, and when alight the gas is turned out. No wood or paper is necessary, and very little ash is made, while the fires are definitely economical in use. We have now on our district some thousands of these coke fires and they are increasing daily. We have over 15,000 consumers taking coke regularly from us.

In conclusion, I should like to thank our Chief Officials, their staffs, and the workpeople for their excellent service. Year by year there are new problems to solve, and new difficulties to overcome, but our officials are always equal to them. Those of you who know our works and our district know that no year passes without greater efficiency in all departments. Our co-partners are keen and interested in their work, and realize, as we do, that our success depends on our selling a good article at a reasonable price, and giving good service to our consumers, which I think we can claim we do. Our works are in excellent condition and of ample capacity, and when the better times we all devoutly hope for arrive, we are fully equipped to meet any increased demand.

The Chairman then moved:

> That the report of the Directors and statement of accounts for the year to Dec. 31, 1932, be received and adopted, and that the report be entered on the Minutes of the proceedings of this day.

Mr. Thomas Goulden: I have much pleasure in seconding the motion now before the meeting.

Mr. F. Church said he was sure they all felt very grateful to their Chairman for the fine address he had given, explaining the business of the Company. The fact that they recorded an increased sale of gas, when so many undertakings were showing decreases, and that they were paying the full statutory dividends, was very gratifying. The strong position of the reserve account, he thought, must be due to the Board having picked out such splendid investments; they were not all trustee securities, but they were all gilt-edged. The co-partnership investments were also excellent and showed an increase over cost of more than £27,000. He was very pleased that the Chairman had touched on the question of allotments. Mr. Church was Chairman of the Hackney Borough Council Allotment Committee, and he knew that these allotments found work for the men who wanted work—and once they had work they forgot their other troubles. In conclusion, Mr. Church congratulated the Chairman, Directors, and staff on the very fine balance-sheet they had given them.

The resolution for the adoption of the report and accounts was then put to the meeting and carried unanimously.

Dividends.

The Deputy-Chairman (Mr. Henry Bailey) then moved:

> That a dividend at the rate of 5½% and 5% per annum respectively on the preference stocks, and £6 15s.% per annum on the ordinary stock, all less income-tax, be declared for the half-year ended Dec. 31, 1932, payable on March 1 next, and that the dividend warrants be sent to the proprietors by post.

He did not think he need say anything to recommend this to the meeting; he was sure it was satisfactory to them all.

Mr. Thomas Goulden seconded the resolution, which was carried unanimously.

Re-election of Directors and Auditor.

The Chairman moved that Mr. Henry Bailey be re-elected a Director of the Company. Mr. Bailey had been a Director so long, he said, that no one remembered how long it was—but it was a very long period. Mr. Bailey was responsible very largely for the finances and investments of the Company, and he was quite sure they would realize how very valuable he was in this respect. He had great pleasure in proposing his re-election.

Mr. William Alfred Surridge, in seconding the proposal, said that Mr. Bailey's presence on the Board with them as Chairman of the Finance Committee had been of great advantage to the Company, and it gave him much pleasure to second his re-election.

The resolution was unanimously carried.

Mr. Henry Bailey, acknowledging, said he was very much obliged to the Chairman and Mr. Surridge for the way in which they had proposed and seconded his re-election. It gave him great pleasure to have served on this Board for so many years. It was a pleasure to attend their meetings, and as long as he could be of use to the Company he would be pleased to do his best for them.

The Chairman then proposed the re-election of Mr. Surridge as a Director of the Company. He and Mr. Surridge had worked together for a very great number of years, and he was a most useful member of the Board. His knowledge of coal would be hard to beat, and they found him in every way a most useful Director.

Mr. Edward Corbet Woodall, seconding, said that it was a great privilege to serve as a colleague with Mr. Surridge.

This motion was also agreed to.

Mr. Surridge, in reply, said he was very much obliged to them for this further mark of their confidence, and he thanked the Chairman and Mr. Edward Corbet Woodall for their complimentary remarks. He hoped in the future to deserve the confidence they had again placed in him.

The Chairman at this stage referred to the enforced absence through indisposition of Mr. Arthur Edward Broadberry, M.Inst.,C.E., which they greatly regretted, and on the suggestion of a shareholder, it was agreed to send him a letter of sympathy.

Mr. W. Beale next moved that Mr. John Eve, F.C.I.S., F.L.A.A., the retiring Auditor, be re-elected, and that the remuneration of the Auditors be £500 per annum. The fee of £500 he said, represented an increase of £100 divisible between the two Auditors over and above the fee now being paid. The increase was reasonable, having regard to the continued growth of the Company, and the fact that three extra Statutory Undertakings had been added to the parent Company.

Mr. J. Taylor seconded the resolution, which was put to the meeting and carried unanimously.

Eighteen Years of Progress.

Mr. John Eve, replying, thanked the mover and seconder for this resolution and all of them very sincerely for re-electing him one of their Auditors. He had been an Auditor of the Company since 1914, and it occurred to him that it might be interesting if he gave some figures indicative of the increase in the Company's business from 1913 to 1932. At that time the district consisted of Edmonton, Tottenham, and part of Southgate, and the consumers numbered 65,000. At the present time, with the subsequent amalgamations, the district had increased to 111 square miles, with 125,000 consumers, 40,000 of whom had been added during the last ten years, so that the previous eight or nine years showed an increase of only 20,000. The sales of gas in 1914 were just under 200 million c.ft.; now they were just under 4000 millions. The total revenue in those days amounted to £318,000; now it was more than £1,020,000. As a result, the work had greatly increased, and he had often wondered whether, when the shareholders looked into the balance-sheet, they ever considered how long it took to audit such an account. This audit, said Mr. Eve, was continuous from January till December; each quarter was audited in turn, and at the end of the year the four quarters were concentrated into the balance-sheet. From what he had said it would be appreciated how the Company had progressed under the various Chairmen who had been at its head since 1914, and this progress was undoubtedly due to their efforts.

Vote of Thanks.

Mr. S. Sandell thereafter proposed that the best thanks of the Proprietors be given to the Chairman, Directors, and Audi-

tors, and also to the Officers, staffs, and workmen for their services to the Company during the past year. It always seemed to him that all these people formed a very happy family, and they must be glad to work together to produce the wonderful results the Chairman had put before them that day. It was not only a large family but an increasing family, owing to the acquisitions they were hearing about. The work of the Company must run very smoothly. They did not hear any complaints from the shareholders, which showed that they were very satisfied with what was going on. They felt that the Directors were very hard workers; the Chief Officers all had to keep abreast with technical improvements that took place from time to time; they had already heard about the Auditors' work; and the rest of the staff must have pleasure in their work in that they were not only working for the Company, but also, through the co-partnership scheme, for themselves.

The vote of thanks was seconded by Mr. MACKAY.

The CHAIRMAN said that they felt very fortunate in having such an excellent staff. They could not produce such reports as these from time to time unless they had a good district—which fortunately they had—and then good workpeople to assist in giving a good-class service. The Officials were the people who did the spade work, and the Directors were fortunate in having such Officials and they in having such staffs and workpeople.

The resolution was carried unanimously.

Mr. H. C. SMITH (Chief Engineer) said that on behalf of the engineering staff and workpeople he would like to thank them very much for the vote. They were certainly a very happy family and were proud to be connected with this Company, which had such splendid records in the past and such excellent prospects for the future.

Mr. E. J. K. FUSSELL, replying on behalf of the clerical staff, also returned thanks for the generous remarks which had been made. They would have gathered that the past year had been one of great activity, and he thought that as a gas undertaking they had created a record in selling one electricity undertaking at a profit and buying three gas undertakings. It was only as a result of the way the staff responded to the greater responsibility thrown upon them that the Chief Officers of the Company were able to show a good account of their stewardship during the year. The remarks that had been made that day would be much appreciated by the staff, and were particularly appreciated by Mr. Smith and himself.

This terminated the business of the meeting.

Gas Companies' Results in 1932

Newcastle-upon-Tyne.

Mr. J. E. Cowen (Chairman of Directors) presided at the Annual General Meeting of the Newcastle-upon-Tyne and Gateshead Gas Company, held on Feb. 21. The annual report on the year's working showed that the revenue was £980,959, and the expenditure £799,448, leaving as profit for the year £181,510, to which has to be added the balance brought forward from the previous year—namely, £46,320, making in all £227,830. The Directors recommended the following appropriation: Interest on debenture stock, loans, &c., to Dec. 31, 1932, £40,808. Interim dividends paid August, 1932: Preference stock at 2%, and ordinary stock at 2½%, together absorbing £65,189; final dividends to Dec. 31, 1932: Preference stock at 2%, making 4% for the year (£13,657), ordinary stock at £2 17s. 6d.%, making £5 7s. 6d.% for the year (£59,262), leaving the balance to be carried forward of £48,912. Owing to the very mild weather and trade depression the sales of gas show a decrease of just under 1% compared with the previous year. The reconstruction of the second half of No. 1 retort plant at Elswick Gas-Works has been completed, and a new gasholder in lieu of two smaller holders has been erected at Chester-le-Street. The price of gas was reduced by 0·2d. per therm from the readings of the meters in June last, and, at the same time, an alteration in favour of consumers was made in the two-part tariff scale. Moving the adoption of the report and accounts, the Chairman said: I said last year that I hoped the number of our consumers, which had been going steadily up, would shortly reach 200,000. I am glad to say we have now passed the 200,000 mark, 3342 new consumers having been added during the year. We can again record progress with our public lighting. There are now over 24,000 public gas lamps in the thoroughfares of the Company's area, being an increase of 800 for the year. This increase, together with lamps converted to high illuminating power, represents an additional consumption of 9 million c.ft. of gas per annum. The popularity of gas for cooking is shown by a net increase of over 5000 cookers during the year. We have also been successful in securing a net increase of over 4300 gas fires. We have also fitted over 5000 water heaters, wash boilers, and set pot burners during the year, and over 3000 grillers, rings, irons, and pokers.

Portsmouth.

At the Annual Meeting of the Portsmouth Gas Company on Feb. 16, the Chairman, Mr. T. H. F. Lapthorn, J.P., was able to announce that in spite of a year of depression the Company had created three records—in the sale of gas, in the number of consumers, which has risen from 69,788 to 71,340, and in the issue of appliances. Mr. Lapthorn stated that during the year the Company had spent net capital to the amount of £29,495, due to the normal development of their district, and he thought it might interest them to know that in 1914 the net capital employed in the concern per 1000 c.ft. of gas used was 6s. 10d., while last year, despite the fact that everything had increased so much, the figure was only 6s. 9d. Their output sales were up by 6½ million c.ft., in spite of the milder weather and the general depression, but their receipts were down by £1534, due to the fact that during the year they had made various concessions to their consumers, including a reduction in the price to the outlying districts, and a revision of the scale of discounts. The expenditure on coke and oil was down by £10,301, due to the fact that coal had cost less and a smaller quantity had been used and that oil had also been reduced in price and less used. Repairs and maintenance of works and plant were up by £11,368, due to the extensive reconstruction, still in hand, of retorts at Hilsea. The profit on the year's working was £74,568, against £81,917 in 1931. The profit and loss account showed a sum of £70,819 available for dividend, and they were recommending the same dividend as before, leaving £42,269 to be carried forward. The appliances sold in 1931 were 5712 in excess of those sold in the previous year, and last year the increase was 7947 over 1931, a record increase. Hitherto, it had been the Company's practice to read their meters as near to quarter days as possible, but that had placed a considerable strain on the staff and had only been possible by diverting fitters from their proper work in order to assist. The Directors had therefore come to the conclusion that it would be wise to adopt the continuous meter-reading system, and the change would come into force after the close of the March quarter. The Directors had also decided to put down a plant to work in connection with their naphthalene apparatus in recovering benzole from gas. The benzole recovered but not used for their own vehicles would be sold to the National Benzol Company. A dividend was declared of 5% on the 5% maximum stock and of 8% on the consolidated stock, both less income-tax.

Southampton.

The Annual Ordinary General Meeting of the Southampton Gaslight and Coke Company was held on Wednesday, Feb. 15, at the Central Offices and Showrooms, 66, Above Bar, Southampton, at noon—Sir H. W. Russell Bencraft, M.R.C.S.E., J.P. (Chairman), presiding. The Chairman, moving the adoption of the report of the Directors and the Audited Statement of Accounts for the year ended Dec. 31, 1932, said: A carefully prepared sales campaign was inaugurated during the latter part of 1932, and the Consumers' Service Department has been remodelled on up-to-date lines. The results up to the present are very encouraging.

For the first time during the past ten years the sales of gas show a small decrease, amounting to 1·48%. This is primarily due to the general industrial depression and the economy now practised by practically every part of the community. It is also due in some degree to the mildness of the weather during the latter part of the year. The sales of coke also show a decrease for similar reasons, which necessitated a substantial reduction in the price charged. The capital expenditure for the year amounts to a net figure of £2084. The balance of the payments for the new intermittent vertical chamber plant came to £4553. Depreciation written off exceeds the amount charged for new mains, meters, and stoves by over £2000. The new intermittent vertical chamber plant was officially opened by His Worship the Mayor of Southampton on March 8 last, and was inspected by a number of the stockholders on July 20. The plant has proved thoroughly efficient and economical in working. The gross profit carried to profit and loss account is £2219 more than in 1931. After paying interest on debenture stock, income-tax, and bank and other interest, there is available for paying dividends the sum of £25,410. The maximum dividend, if passed by the stockholders, will absorb £19,631, leaving a balance to be carried forward of £5779. Additional capital, in the shape of £50,000 5% redeemable debenture stock, 1967, and £25,000 5½% irredeemable preference stock, was issued in April last, and realized £78,122, the premiums amounting to £3122. Mr. T. Carmichael, in seconding the resolution, said: First of all, I would refer to the installation of intermittent vertical chamber ovens, which has now been working for a year, and to say that the installation has thoroughly justified itself in every way and is giving every satisfaction. The plant is in excellent condition, and the results are well up to the guarantees given to us by the Contractors, the Woodall-Duckham Vertical Retort and Oven Construction Company, Ltd. All the expected economies have been realized, the yield of gas per ton of coal carbonized being 12% more than in the old plant, while the cost per therm of gas produced is 20% lower. I think these are very satisfactory figures. Immediately following the Ordinary Meeting an Extraordinary Meeting was held, which approved the application proposed to be made by the Company to the Board of Trade under the Gas Undertakings Acts, 1920 and 1929, for a Special Order:

(*a*) To authorize the Company to raise additional money by the creation and issue of new shares or stock and by borrowing and by the creation and issue of debenture stock;
(*b*) To authorize a basic price or basic prices in lieu of the maximum price or prices and a basic dividend in lieu of the maximum dividend;
(*c*) For such other purposes as the Directors of the Company may deem necessary or expedient.

GAS MARKETS & MANUFACTURES

Stock Market Report.

[For Stock and Share List, see later page.]

Business on the Stock Exchange was again restricted by the uncertainty of international affairs, and added to this last week were the depressed conditions on the New York Stock Exchange. Except for British Government securities, which continued to maintain a high level, and some activity in South African gold mining shares, there were few signs of any increased activity. An item of interest was the announcement of a conversion scheme to deal with the New South Wales 4% stock which matures on July 1 next, by which holders are invited to convert into an equal amount of 4% registered stock repayable 1955-70, while the P. & O. Steam Navigation Company and Vickers, Ltd., are exchanging expensive debentures for those bearing a lower rate of interest.

The continual upward movement of prices in the Gas stock and share market leaves no doubt of the widely increasing popularity which these issues have attained. The strength of the present position is well illustrated by the low yields now obtainable on the leading ordinary stocks—*e.g.*, Gas Light £1 units at 26s. yield £4 6s. 1d.%, South Metropolitan at 127 gives a return of £4 14s. 6d.%, and South Suburban at 125 is a little higher at £4 16s.%. These three stocks were marked *ex* div. last week, though in the case of the South Metropolitan stock the price remains the same and almost negligible reductions occurred in the other two issues. Debenture stocks have also been heavily supported, and here again prices continue to harden. The yield on Gas Light 3% at the present price of 80 works out at £3 15s.%—a few shillings only above that on British Government stocks—and is significant of the high value placed on these securities. There are still, however, a few perpetual debenture stocks in the list yielding about 4% which are attractive.

A number of ordinary and preference stocks were marked *ex* div. last week, though in no case was the reduction in price, if any, equivalent to the amount of the dividend paid, while in the case of Shrewsbury ordinary the price was marked up 7 points on the week to 125-130 xd. Two other increases of note were Alliance and Dublin 4% debenture and East Hull ordinary, both with gains of 5 points to 90 and 104½ respectively.

The Directors of the European Gas Company are recommending a final dividend for 1932 of 3½%, making 6% for the year, free of tax, as against 5¼%, free of tax, for 1931. The value of this stock has increased by no less than 30 points compared with a year ago and the yield at the current price of 135½ is £5 18s.%.

Current Sales of Gas Products.

The London Market for Tar Products.

LONDON, *Feb.* 27.

There is little change to report in the prices of tar products, which are as follows:

Pitch is about 95s. per ton f.o.b.

Creosote is 3¾d. to 4¼d. per gallon f.o.b., according to specification.

Refined tar is about 4¼d. to 4½d. per gallon in bulk at makers' works.

Pure toluole is about 2s. 3d.; pure benzole, about 1s. 11d.; solvent naphtha, 95/160, about 1s. 7d. to 1s. 8d.; and 90/140 pyridine bases, about 3s. 9d. per gallon naked at makers' works.

Tar Products in the Provinces.

Feb. 27.

The average prices of gas-works products during the week were: Gas-works tar, 34s. to 39s. Pitch—East Coast, 85s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 85s. f.o.b.* Toluole, naked, North, 1s. 9d. to 1s. 10d. Coal-tar crude naphtha, in bulk, North, 6d. to 6¼d. Solvent naphtha, naked, North, 1s. 5½d. to 1s. 6d. Heavy naphtha, North, 10d. to 11d. Creosote, *ex* works, in bulk, North, liquid and salty, 2¼d. to 2¾d.; low gravity, 1¼d.; Scotland, 2¼d. to 2¾d. Heavy oils, in bulk, North, 4¾d. to 5¼d. Carbolic acid, 60's, 2s. 7d. to 2s. 8d. Naphthalene, £9 to £10. Salts, 55s. to 75s., bags included. Anthracene, "A" quality, 2½d. per minimum 40%, purely nominal; "B" quality, unsaleable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *Feb.* 25.

Production of most products is in excess of demand, and consequently quotations are irregular. Refined tar for road making is commanding a great deal of attention at present, but value has not yet been determined.

Crude gas-works tar.—The actual value is 45s. to 50s. per ton *ex* works.

Pitch.—Export value is nominal at round 85s. per ton f.o.b. Glasgow. In the home market quotations are unchanged at 85s. to 90s. per ton *ex* works in bulk.

Refined tar to Ministry of Transport Specification is in the limelight, but, in many cases, consumers are waiting on a further reduction consequent upon the easier tendency of pitch. Meantime, distillers are firm at 3¾d. per gallon *ex* works in buyers' packages.

Creosote oil is dull with values of all grades easy in tone. B.E.S.A. Specification is 2½d. to 3d. per gallon; low gravity, 2¼d. to 2¾d. per gallon; and neutral oil, 2½d. to 3d. per gallon; all *ex* works in bulk.

Cresylic acid.—Market is poor with values unstable. Pale, 97/99%, is 10d. to 11d. per gallon; dark, 97/99%, 9d. to 10d. per gallon; and pale, 99/100%, 1s. 1d. to 1s. 2d. per gallon—all f.o.r. in buyers' packages.

Crude naphtha is steady at 4½d. to 5d. per gallon *ex* works, according to quantity and quality.

Solvent naphtha.—90/160 grade is 1s. 2d. to 1s. 3d. per gallon, and 90/190 grade is 11d. to 1s. per gallon.

Motor benzole.—Supplies are low, and the price is 1s. 4d. to 1s. 5d. per gallon *ex* works in bulk.

Pyridines.—90/160 grade is 2s. 9d. to 3s. per gallon, and 90/140 grade 3s. to 3s. 3d. per gallon.

Benzole Prices.

These are considered to be the market prices for benzole at the present time.

	s. d.		s. d.	
Crude benzole	0 10½	to	0 11	per gallon at works
Motor ,,	1 6½	,,	1 7	,, ,, ,,
Pure ,,	1 10	,,	1 11	,, ,, ,,

Trade Notes.

"Simplex" Water Gas Plant.

The Nairn Gas Light Company, Ltd., have placed an order with the Vertical Gas Retort Syndicate, Ltd., of 17, Victoria Street, Westminster, S.W. 1, for an improved type "Simplex" water gas plant.

Welded and Lapwelded Spigot and Faucet Tubes.

A new catalogue dealing with the firm's steel tubes for gas, water, and sewage has been published by the British Mannesmann Tube Company, Ltd., of Newport (Mon.). The booklet contains much useful information regarding pipe specifications, together with photographic illustrations of plant and actual installations.

Contracts Advertised To-Day.

Carbonizing Plant.

Oldbury Urban District Council. [Advert. on p. 576.]

Coal.

The Wallasey Corporation. [Advert. on p. 576.]

Barrow-in-Furness Gas and Water Department. [Advert. on p. 576.]

General Stores, &c.

Spenborough Gas Department. [Advert. on p. 575.]

Halifax Corporation Gas Committee. [Advert. on p. 576.]

Mantles.

Spenborough Gas Department. [Advert. on p. 575.]

Meters, &c.

Spenborough Gas Department. [Advert. on p. 575.]

Oxide of Iron.

Halifax Corporation Gas Committee. [Advert. on p. 576.]

Pipes, &c.

Spenborough Gas Department. [Advert. on p. 575.]

Halifax Corporation Gas Committee. [Advert. on p. 576.]

Sulphuric Acid, &c.

Halifax Corporation Gas Committee. [Advert. on p. 576.]

Valves, Cocks, and Fittings.

Halifax Corporation Gas Committee. [Advert. on p. 576.]

STOCK AND SHARE LIST.

Official Quotations on the London and Provincial Stock Exchanges.

[For Stock Market Report, see earlier page.]

Issue. £	Share.	When ex-Dividend.	Dividends. Prev. Hf.-Yr. % p.a.	Dividends. Last Hf.-Yr. % p.a.	NAME.	Quotations Feb. 25. (Provincial Exchanges Feb 24.)	Rise or Fall on Week.	Transactions. Lowest and Highest Prices During the Week.
1,551,868	Stk.	Oct. 3	7½	7½	Alliance & Dublin Ord. ...	112–122	...	117
374,000	,,	Jan. 9	4	4	Do. 4 p.c. Deb. ...	85–95	+5	92½–92¼
557,655	,,	Aug. 22	7	7	Barnet Ord. 7 p.c.	147–152	...	...
300,000	1	Oct. 17	1/9⅔	1/4⅔	Bombay, Ltd.	24/6–26/6	+-/6	25/1½–25/6
178,280	Stk.	Feb. 20	9½	9½	Bournemouth sliding scale	192–202*	−3	195
550,050	,,	,,	7	7	Do. 7 p.c. max. ...	152–162*	+2	154
439,160	,,	,,	6	6	Do. 6 p.c. Pref. ...	136–141*	−2	139–140
50,000	,,	Dec. 19	3	3	Do. 3 p.c. Deb. ...	75–80	...	...
162,025	,,	,,	4	4	Do. 4 p.c. Deb. ...	98–103	...	...
210,000	,,	,,	5	5	Do. 5 p.c. Deb. ...	120–125	...	...
357,900	,,	Aug. 22	7½	7½	Brighton, &c. 6 p.c. Con. ...	143–148	...	...
540,000	,,	,,	6⅔	6⅔	Do. 5 p.c. Con. ...	133–138	...	...
195,500	,,	,,	6	6	Do. 6 p.c. B Pref.	135–145	...	141
1,487,500	,,	Aug. 8	5	5	Bristol 5 p.c. max.	111–112*a*	...	...
120,420	,,	Dec. 19	4	4	Do. 1st 4 p.c. Deb. ...	99–101*a*	+⅛	...
217,870	,,	,,	4	4	Do. 2nd 4 p.c. Deb. ...	97–99*a*	+2	...
328,790	,,	,,	5	5	Do. 5 p.c. Deb.	120–124*a*	...	...
855,000	,,	Oct. 8	8	7	British Ord.	145–150	...	146–148
100,000	,,	Dec. 19	7	7	Do. 7 p.c. Pref.	140–150	...	...
350,000	,,	,,	—	5⅛	Do. 5⅛ p.c. Pref. ...	105–110	...	...
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb. ...	95–100	...	...
450,000	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	105–115	...	...
160,000	,,	Jan. 9	5	5	Cambridge 5 p.c. Deb. ...	117–122	...	...
100,000	10	Dec. 5	6	6	Cape Town, Ltd.	7⅞–8⅛	+¼	...
100,000	10	Nov. 7	4½	4½	Do. 4½ p.c. Pref. ...	6–7	...	...
150,000	Stk.	Dec. 19	4½	4½	Do. 4½ p.c. Deb. ...	88–93	...	...
626,860	,,	Feb. 20	6	6	Cardiff Con. Ord.	108–113*	−2	...
237,860	,,	Jan. 9	2½	5	Do. 5 p.c. Red. Deb.	105–110	...	...
157,150	,,	Feb. 20	5	6½	Chester 5 p.c. Ord.	93–98*	...	...
98,936	1	Oct. 17	2/-	2/-	Colombo, Ltd. Ord.... ...	25/–30/-	...	...
21,500	1	Oct. 17	1/4⅔	1/4⅔	Do. 7 p.c. Pref. ...	19/- 21/-	...	...
609,204	1	Oct. 17	/10'90	/11'47	Colonial Gas Assn. Ltd. Ord.	16/– 18/-	...	...
296,053	1	,,	1/2'54	1/3'30	Do. 8 p.c. Pref.	19/6 21/6	...	...
1,796,955	Stk.	Feb. 20	5	6½	Commercial Ord.	111–116*	−2	112–115
475,000	,,	Dec. 19	3	3	Do. 3 p.c. Deb. ...	75–80	...	...
265,272	,,	—	—	—	Do. 5 p.c. Deb. ...	118–123	+1	119–122½
807,560	,,	Feb 20	7	7	Croydon sliding scale ...	143–14-*	−1	145–147
469,590	,,	,,	5	5	Do. max. div.	98–103*	...	100–100½
500,000	,,	Jan. 9	5	5	Do. 5 p.c. Deb.	117–122	...	...
542,270	,,	Aug. 8	10	7	Derby Con.	150–166*c*	...	...
55,000	,,	Jan. 9	4	4	Do. 4 p.c. Deb.	80–85*c*	...	...
209,000	,,	Sept. 5	5	5	East Hull Ord. 5 p.c. ...	102–107	+5	...
179,500	,,	Aug. 22	5½	6	East Surrey Ord. 5 p.c. ...	120–125	...	...
155,019	,,	Dec. 19	5	5	Do. 5 p.c. Deb. ...	117–122	+2	120
1,002,180	,,	Sept 19	†6½	†5	European, Ltd.	133–138	+1	132½–136
19,378,992	,,	Feb. 20	5⅝	5⅞	Gas Light & Coke 4 p.c. Ord.	25/– 26/-*f*	-/6	25/6 - 26/3
2,600,000	,,	,,	3¾	3¾	Do. ¾ p.c. max.	82–87*	...	85–86
4,477,106	,,	,,	4	4	Do. 4 p.c. Con. Pref. ...	100–103*	−1	101⅞–103
6,102,497	,,	Dec. 19	3	3	Do. 3 p.c. Con. Deb. ...	78–82	+1	80–81¼
3,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	114–117	...	117
3,500,000	,,	,,	4½	4½	Do. 4½ p.c. Red. Deb. ...	110–113	...	110⅞–112
270,466	,,	Aug. 22	—	6	Harrogate New Cons. ...	110–115	...	...
82,500	,,	Aug. 22	7	7	Hastings & St. L. 5 p.c. Conv.	130–140	...	...
258,740	,,	,,	5½	5½	Do. 5¼ p.c. Conv.	107–112	...	...
70,000	10	Oct. 17	‡10	‡10	Hongkong & China, Ltd. ...	9½–10¼	...	...
218,200	Stk.	Aug. 22	6	6	Hornsey Con. 5¼ p.c. ...	118–123	...	...
5,600,000	,,	Nov. 21	14	10	Imperial Continental Cap.	210–220	...	210–214½
223,130	,,	Feb. 6	8½	8½	Do. 8½ p.c. Red. Deb.	89–94	...	...
235,242	,,	Aug. 8	8⅝	8⅝	Lea Bridge 5 p.c. Ord. ...	165–170	...	...
2,145,907	,,	Aug. 22	6	6	Liverpool 5 p.c. Ord. ...	123–125*b*	...	...
245,500	,,	Dec. 19	5	5	Do. 5 p.c. Red. Pref. ...	105–115*b*	...	...
306,088	,,	Jan. 19	4	4	Do. 4 p.c. Deb. ...	99–101*b*	...	...
165,736	,,	Feb. 20	8	10	Maidstone 5 p.c. Cap. ...	180–200*	...	...
56,176	,,	Dec. 19	3	3	Do. 3 p.c. Deb. ...	68–73	...	...
75,000	£	Dec. 5	†10	†10	Malta & Mediterranean ...	8–9	...	...
392,000		Oct. 1	5½	5½	Metropolitan (of Melbourne) 5½ p.c. Red. Deb.	98–103	...	...
231,978	Stk	Sept. 5	5	5	M. S. Utility "C." Cons. ...	100–105	...	...
818,657	,,	,,	4	4	Do. 4 p.c. Cons. Pref.	92–97	+2	95½–96
112,126	,,	Jan. 9	4	4	Do. 4 p.c. Deb. ...	101–103	+1½	...
148,955	,,	,,	5	5	Do. 5 p.c. Deb. ...	115–120	...	...
675,000	,,	31 May '31	†6	†6	Montevideo, Ltd.	35–45	...	...
2,961,315	,,	Aug. 8	5⅛	5	Newcastle & Gateshead Con.	23/3–24/3*d*	...	...
682,856	,,	,,	4	4	Do. 4 p.c. Pref. ...	97–99*d*	...	...
776,706	,,	Jan. 9	3½	3½	Do. 3½ p.c. Deb. ...	89–91*d*	...	...
277,285	,,	Nov. 7	5	5	Do. 5 p.c. Deb. '42...	103–107*d*	...	...
274,000	,,	Feb. 20	5	5	Newport (Mon.) 5 p.c. max.	98–100a*	−1½	...
204,940	,,	Aug. 22	7½	7½	North Middlesex 6 p.c. Con.	135–145	...	...
396,160	,,	Feb. 6	5	5	Northampton 5 p.c. max. ...	98–103	...	...
300,000	,,	Dec. 5	7	9	Oriental, Ltd.	112–117	...	...
205,162	,,	Dec. 19	8	8	Plym'th & Stonehouse 8 p.c.	140–150	...	...
504,416	,,	Feb. 20	8	8	Portsm'th Con. Stk. 4 p.c. Std.	152–162*	...	160
241,446	,,	,,	5	5	Do. 5 p.c. max. ...	97–102*	...	...
114,000	,,	Feb. 20	5	5	Preston 5 p.c. Pref.	103–108*	−2	...
686,312	,,	Jan. 23	4	4	Primitiva 4 p.c. Rd. Db. 1911	82–87	...	...
389,813	,,	Dec. 19	4	4	Do. 4 p.c. Cons. Deb.	82–87	...	...
150,000	10	Sept. 19	6	6	San Paulo 6 p.c. Pref. ...	6⅞–7⅛	...	...
1,736,968	Stk.	Sept. 5	6	6	Sheffield Cons.	114–116*e*	...	...
95,000	,,	Jan. 9	4	4	Do. 4 p.c. Deb. ...	91–95*e*	...	...
133,201	,,	Feb. 20	8½	5	Shrewsbury 5 p.c. Ord. ...	125–130*	+7	125–128
90,000	10	June 6	15	15	South African	4–6	...	...
6,709,895	Stk.	Feb. 20	5	7	South Met. Ord.	124–129*	...	125½–130
1,135,812	,,	,,	6	6	Do. 6 p.c. Irred. Pf.	138–143*	...	139½–140
850,000	,,	,,	—	20/-*g*	Do. 4 p.c. Irred. Pf.	100–103*	...	101⅞–102⅝
1,895,445	,,	Jan. 9	3	3	Do. 3 p.c. Deb. ...	77–81	...	80–80⅞
1 000,000	,,	Jan. 23	5	5	Do. 5 p.c. Red. Deb.	108–113	...	111
209,820	,,	Aug. 8	8½	8½	South Shields Con.	150–155*	...	...
1,543,795	,,	Feb. 20	6	6	South Suburban Ord. 5 p.c.	121–126*	−1	121½
300,000	,,	,,	5	5	Do. 5 p.c. Pref.	112–117*	...	115
868,837	,,	Dec. 19	5	5	Do. 5 p.c. Deb.	120–125	...	...
647,740	,,	Feb. 20	5	5	Southampt'n Ord. 5 p.c. max.	103–108*	−2	...
121,275	,,	Dec. 19	4	4	Do. 4 p.c. Deb.	98–103	...	103
350,000	,,	Aug. 8	—	9/-	Swansea 5½ p.c. Red. Pref.	110–114	...	...
200,000	,,	Dec. 19	6½	6½	Do. 6½ p.c. Red. Deb.	103–108	...	...
1,076,490	,,	Aug. 8	6⅔	6⅔	Tottenham and District Ord.	138–143	...	140
300,000	,,	,,	5½	5½	Do. 5½ p.c. Pref. ...	120–125	...	120–123½
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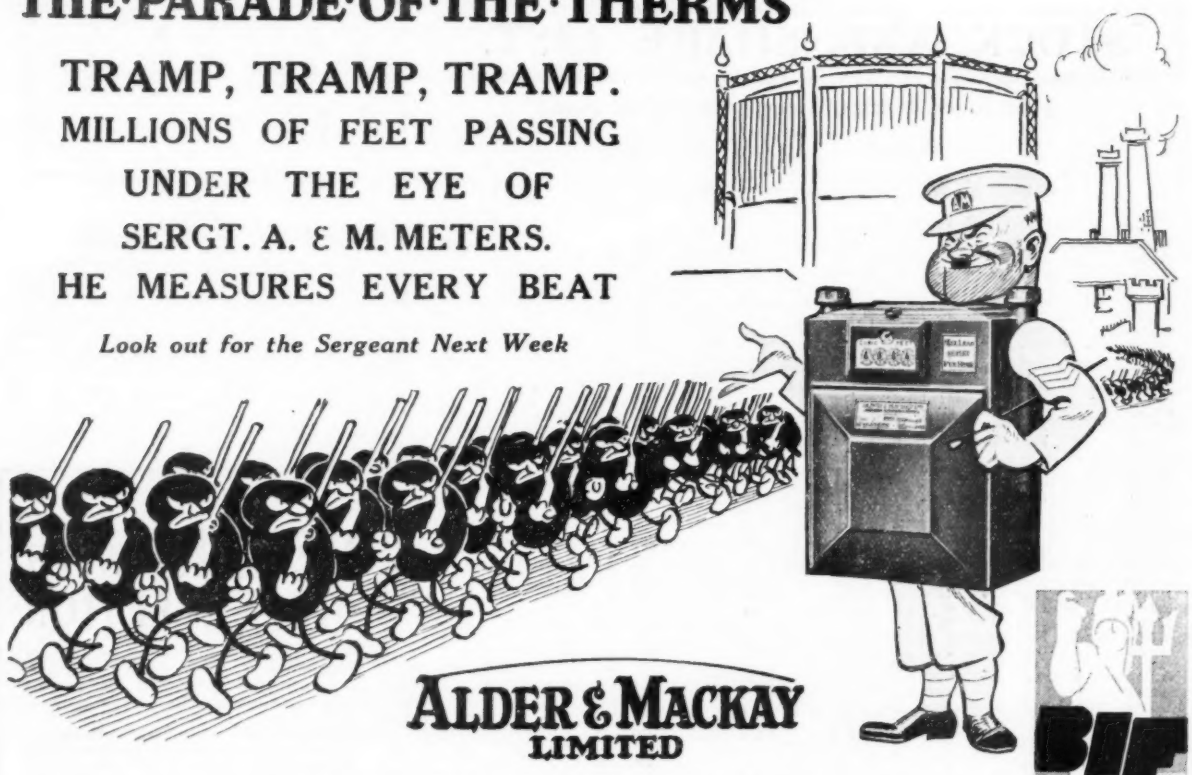

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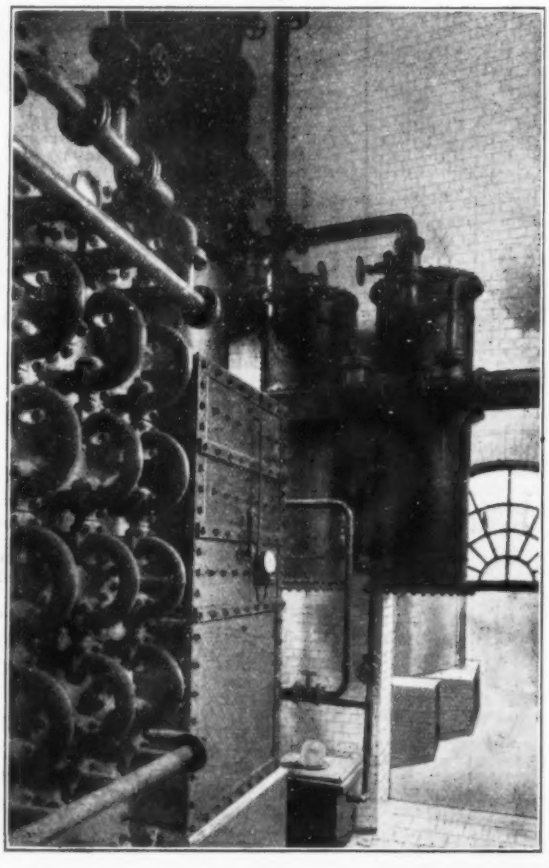

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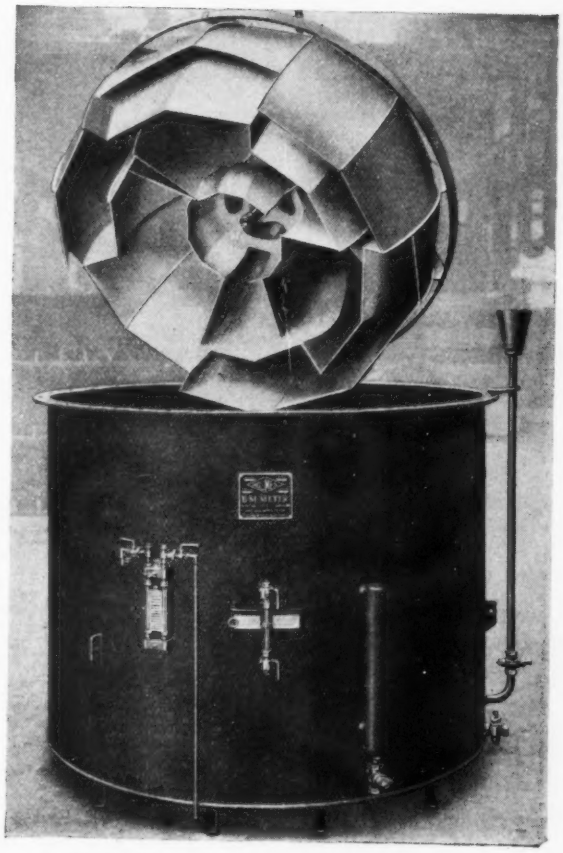

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